APRIL 20, 1953

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

How Much Television Interference Is Caused by Power Lines ?

5%? 15%? 30%? 50%?

For Answers See Page 116

Compare the Costs of Voltage Regulation

4160 Volt Y Substation Load of 3000 Kva, Two 200 Amp Radial Feeders

Cost of ±10% Regulation

- Single-phase Feeder Regulation with six 200 ampere Station Regulators — **$15,492**
- 3-phase Feeder Regulation with two 150 Kva Station Regulators — **$14,304**
- 3-phase Bus Regulation with 3-phase Station Regulator — **$9775**
- 3-phase Bus Regulation with LRC on 3000 Kva Step-down Transformers — **$8362**
- **Single-phase Feeder Regulation with six 200 amp Distribution Regulators** — **$7356**

ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS

Get Accurate, Reliable Service

The chart above shows why it will pay you to analyze changes in system economics brought about by Allis-Chalmers distribution regulators. They give you highest quality voltage regulation at a cost lower than any other method of regulating voltage.

Result of 20 Years of ⅝ % Development

Allis-Chalmers distribution regulators give you all the advantages of ⅝% step regulation. You get a ± 1 volt band, 20% range, and a wide line that includes a rating for nearly every voltage need. In addition, you get Allis-Chalmers features like "Feather-Touch" control, unit-type construction, long-life contacts, and a mechanism that can withstand five million operations.

Get Cost Comparison Charts

A set of six charts is available to help you analyze savings you can make on many different systems with Allis-Chalmers distribution regulators. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for full information.

A-4043

ALLIS-CHALMERS

Originators of ⅝% Step Regulation

Notes From Chicago

Unofficial reports on the EEI Sales Conference indicate that more visitors than ever attended the most interesting and entertaining event of its kind to date. Some of the highlights were:

Lee Taylor, Detroit Edison's lighting specialist, may be a new rival to Hollywood's Orson Wells. Writing, directing, and acting in "We Have Watts to Burn" could be his first step on the road to thespian fame.

Reddy Kilowatt has become a member of the family. To emphasize this he was introduced by Ashton Collins along with Mother, Father, Junior, and Fido. The group became a familiar sight as they dropped in on various sessions.

Salivary glands were stimulated as viewers saw Raytheon's radar oven cook a 10-lb turkey in 15 minutes.

On the lighter side, those who were at the Bendix cocktail party report it as a memorable one.

Lowell Mason, Federal Trade Commissioner, arrived breathless and dishevelled from his trip to the 21st Century. The tales he brought back were vivid if alarming. Let's hope that machine missed fire and it was really Mars he saw.

Television played a part in the meeting when a film recording was made of the "More Power to America" award. Pittsburgh and Dayton are among the spots where this will appear.

"The Case of the Deep Pocket Lad" with a professional cast should have impressed the audience with the desirability of entering the contests. The show was outstanding.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 139 No. 16 — April 20, 1953

CONTENTS

Editorials 101

News

The Electrical Week 103
Washington Comment 121
Technical Notes 121
Statistics 122
Financial News 123
News About People 202
Manufacturers & Markets 212

Features

Put More Power in Selling, Utilities Told 108
Sources of Radiation Must Be Controlled ..... Ottmar W. Noeske 112
TV Interference—The Utility's Story 116
One Line Diagram Saves Engineering Time ..... F. W. Smith 118
Air Conditioners Demand Balanced 3-Phase Voltage ..... B. M. Gallaher 120
Sympathetic Tripping of Feeders ..... Paul A. Oakes 126
Demonstrator Teaches Synchronizing ..... E. M. Humphries 128
Plant Economy Starts at the Turbo-Generator ..... Edwin H. Krieg 130

Departments

How To 137
Engineering Reference Sheet 138
New Equipment 170
Letters 180
What They're Saying 196
Books 226
Catalogs & Bulletins 230
Index of Advertisers 237

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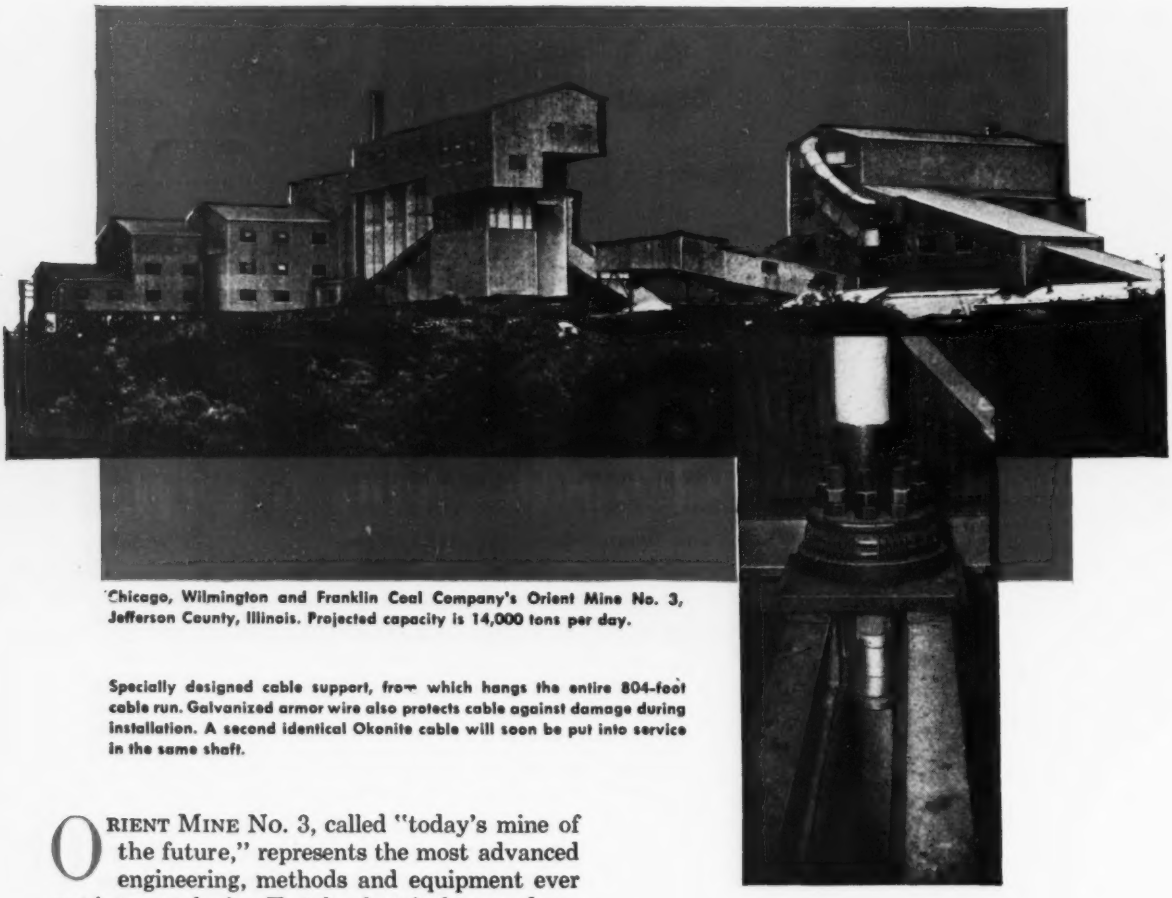
OKONITE CABLES supply underground power to world's most modern mine



Chicago, Wilmington and Franklin Coal Company's Orient Mine No. 3, Jefferson County, Illinois. Projected capacity is 14,000 tons per day.

Specially designed cable support, from which hangs the entire 804-foot cable run. Galvanized armor wire also protects cable against damage during installation. A second identical Okonite cable will soon be put into service in the same shaft.

ORIENT MINE No. 3, called "today's mine of the future," represents the most advanced engineering, methods and equipment ever put into a coal mine. To take electrical power down the 800-foot shaft, the mine's engineers specified one of the highest voltage shaft cables ever to be installed in an Illinois mine—an 8-ton, 8,000 volt, shielded Okonite cable.

Key to the unusual reliability of this primary feeder cable under shaft-hole conditions is its Okolite insulation. This high voltage insulation resists corona cutting, moisture and heat, maintains its stable electrical characteristics under heavy current throughout a long service life.

Okolite insulation has been used more than a quarter of a century for unusual installation like this, as well as for control wiring, underground systems and submarine cables. The same exclusive method of strip insulating, the same ultra-high voltage testing, the same carefully developed compound, is used on *all* Okolite insulated cable to insure against premature cable failure with your electrical circuits.

On all key circuits—circuits whose failure would mean loss of production and down time—specify rugged, long-lasting cables engineered and manufactured by The Okonite Company, Passaic, N. J.

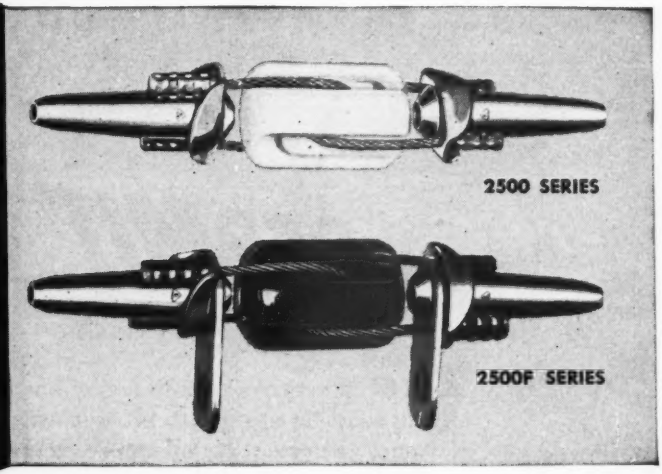
The best cable is your best policy

OKONITE SINCE 1878 *insulated wires and cables*

1330

for the largest number of line applications at the lowest possible cost...

USE *Electroline* Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

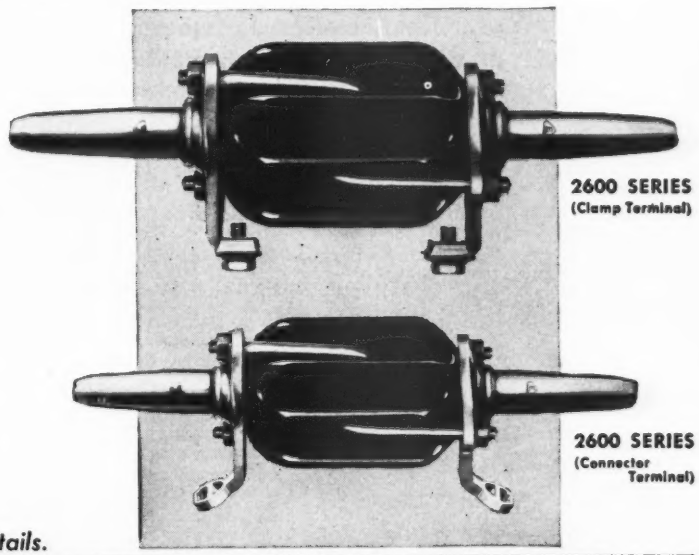
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



Send for Bulletins containing complete details.

TALENT TO ORIGINATE · E · ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

Alduti Interrupter Switches

PERMIT ARC-FREE

The practice of mounting sectionalizing switches upright to provide arc clearance is often inconvenient and costly. This is especially true where a vertical conductor configuration is used. In this case, the transposition of conductors into the horizontal plane for pole top switching requires a longer span and a higher pole; and the wide spacing demanded by horn gap switches often results in a costly supporting structure.

On the other hand, with the installation of an Alduti Interrupter Switch vertical conductor configuration, regular span lengths and regular pole height can be retained. In many cases the installation can be made on an existing line pole, and no switch supporting structure other than the pole itself is needed.

Because Alduti Interrupter Switches operate without external arcing there is no limitation imposed on line design to provide arcing clearance for switches. Switch configuration can conform to the configuration of the line. This opens the door to development of "unconventional" improvements in switch mounting techniques, of which the illustration is a typical example.

Yet these structural advantages are but part of the story. With interrupter switches you are no longer restricted to present sectionalizing practices. Feeders and branch lines can now be safely switched without sequencing with breakers or dropping individual loads —because Alduti Interrupter Switches interrupt not only line or cable charging currents, but also 600 amperes of load current.

Why not discuss with your S&C sales representative the advantages of this new kind of sectionalizing switching.

Alduti Interrupter Switches are supplied in the following ratings:

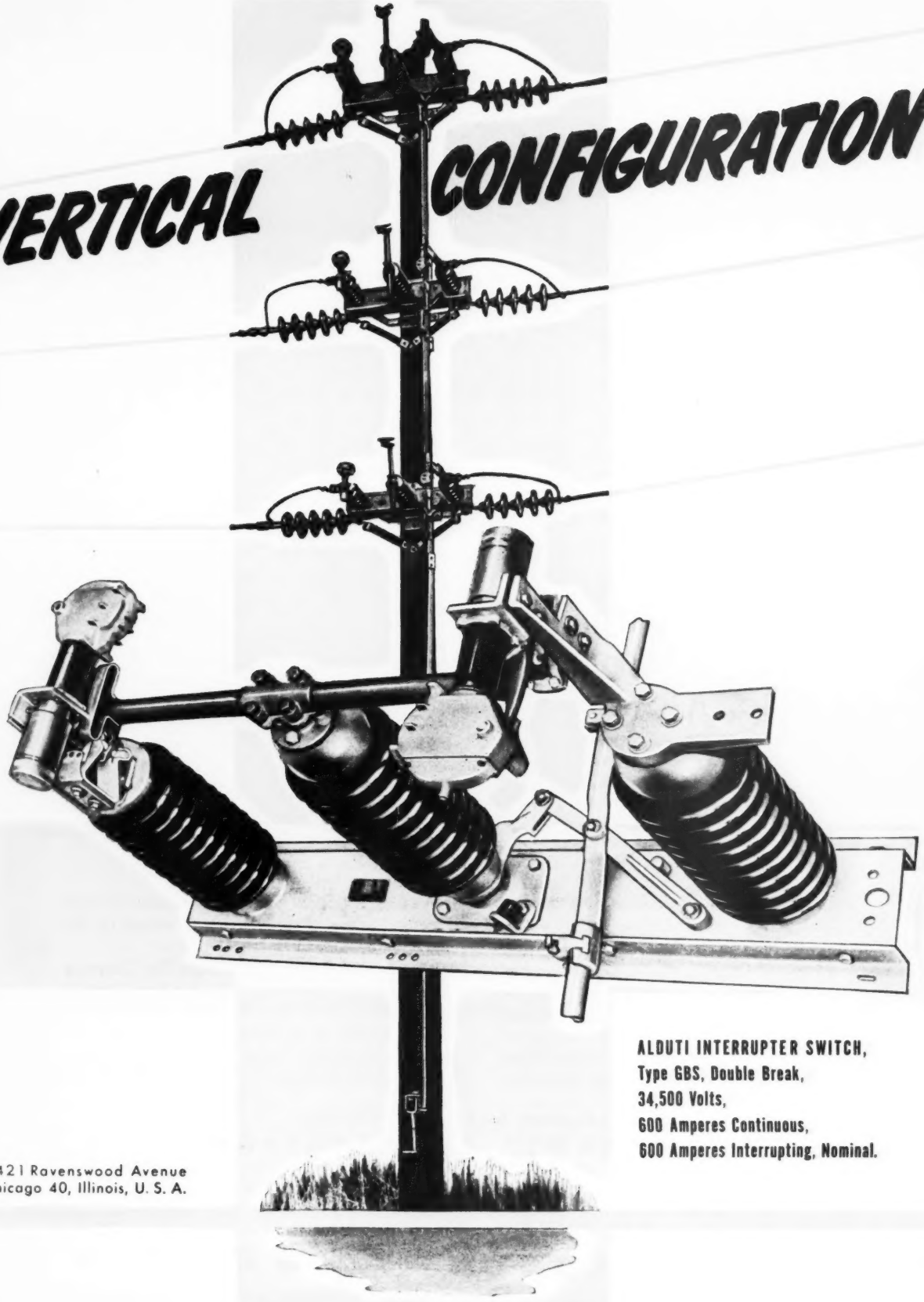
Volts	Amperes Continuous	Amperes Interrupting, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

Formerly SCHWEITZER & CONRAD, INC.

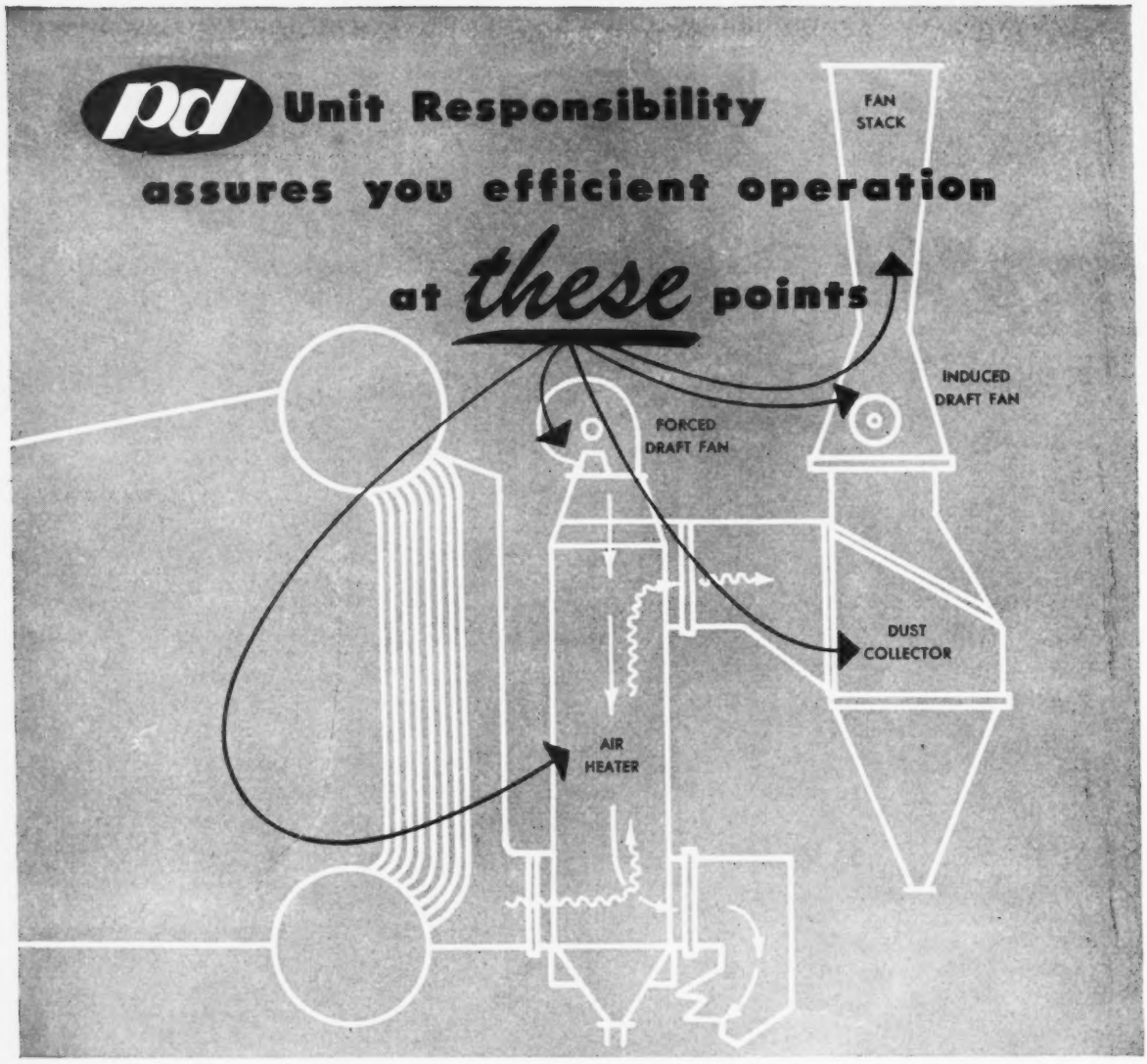
In Canada, Powerlite Devices, Limited, Toronto

VERTICAL CONFIGURATION



ALDUTI INTERRUPTER SWITCH,
Type GBS, Double Break,
34,500 Volts,
600 Amperes Continuous,
600 Amperes Interrupting, Nominal.

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.



Unit Responsibility, for important components of plant design by the Prat-Daniel Corporation, relieves your engineers of necessary problems of coordination that often arise when equipment is purchased from several sources.

Prat-Daniel, designing and manufacturing engineers of *Forced Draft Fans*, *Air Preheaters*, *Tubular Dust Collectors*, *Induced Draft Fans* and *Fan Stacks*, make possible this coordination of components by a single company with over a quarter of a century experience in the power field.

This service is offered through The Thermix Corporation, project engineers for Prat-Daniel. Specialists in this field, they can assure you a completely integrated system. Why not contact Thermix today. Ask for the new P-D Bulletin 4P201.

Project Engineers for Power Plant Division

THE THERMIX CORPORATION

GREENWICH, CONN.

(Offices in 38 Principal Cities)

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PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks.

looking into
the future
of

BAKELITE POLYETHYLENE

TRADE-MARK

wire covering

The picture above shows samples of BAKELITE Polyethylene being subjected to intense sunlight, day-night effects, and rain – years of exposure crammed into hours – showing evidence of the long-term service to be expected from this great advance in wire and cable constructions.

After this treatment, they will be tested for such features as tensile strength, abrasion resistance, and low temperature flexibility—properties important to their use as wire covering and insulation.

The picture to the right shows wires, covered with black BAKELITE Polyethylene, that have been exposed for years to actual outdoor weathering. There has been no sign of cracking or crazing.

This is just one series of tests made on BAKELITE Polyethylene to maintain quality and to prove its durability. This superior wire covering resists chemicals, oil, water immersion, abrasion. The approved black compound stays flexible down to —70 deg. C., resists deformation up to 90 deg. C. It meets ASA suggested specifications (second draft: July 20, 1952) for weather-resistant wire and cable.

BAKELITE Polyethylene, extruded onto wire, won't festoon. It provides a thin, smooth-surfaced covering that speeds stripping and splicing. Its low specific gravity, only 0.92, means lighter weight—easier stringing.

Kabelitems #48 gives detailed information on BAKELITE Polyethylene. For your free copy, write Dept. QB-63.

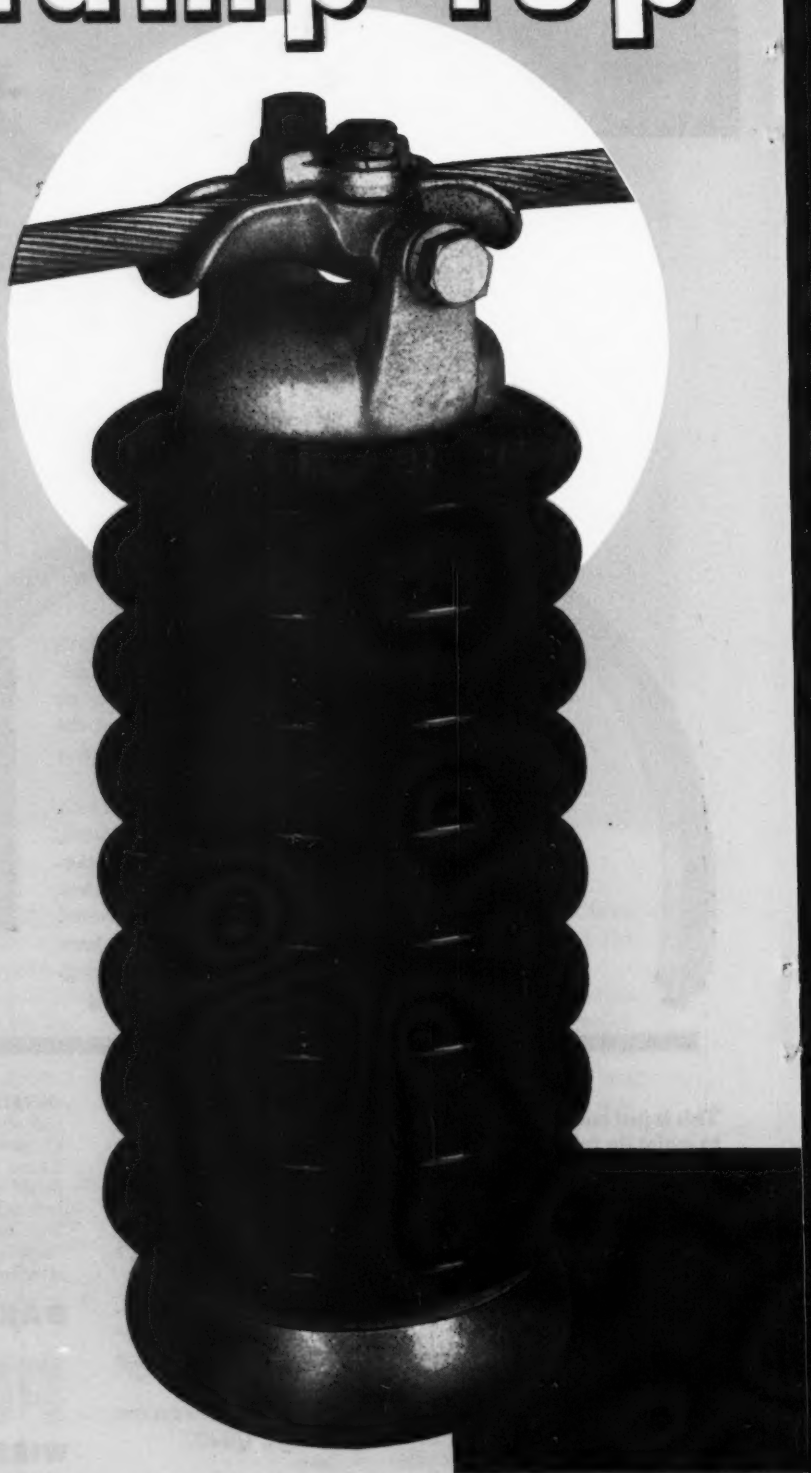
OUTSTANDING ELECTRICAL PROPERTIES for signal systems and service drop, wet or dry – at 50 megacycles and 25 deg. C., power factor is only 0.0005; dielectric constant only 2.35. These values hold through the range from 60 cycles to 5×10^7 cycles. Operating temperatures up to 90 deg. C. have little effect on electrical properties. Insulation resistance is too high to measure on conventional testing devices. BAKELITE Polyethylene excels in resistance to voltage breakdown, even after long-time water immersion.

BAKELITE
TRADE-MARK
POLYETHYLENE
WIRE COVERING

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.

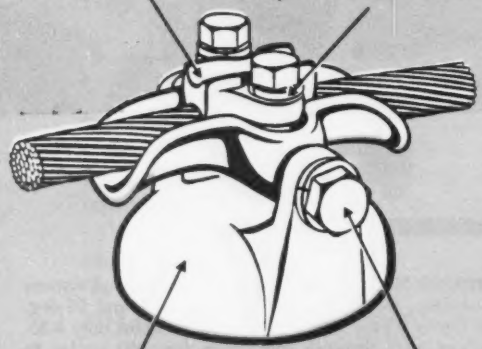
Lapp announces

Clamp-Top



Reversible keepers—and four sizes of clamps (interchangeable on all sizes of insulators) —provide correct fit for all conductor sizes .25" to 1.50".

Captive lock-washers on clamp cap screws; only one loose part for conductor installation. Greatest convenience for hot-line work!

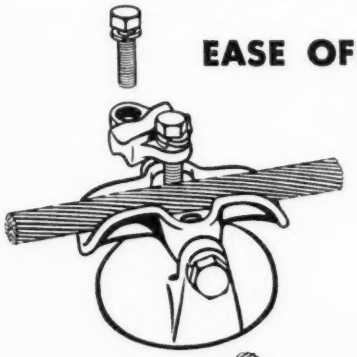


Trunnion cap screw serves as one end of trunnion bearing. Backing-off (without removal) disengages clamp which remains attached to conductor.

Metal cap cemented to outside of porcelain bead. External hardware attachment protects porcelain from internal bursting forces.

Line Post

For those who feel that the advantages of clamp-top line insulators outweigh their disadvantages*, Lapp offers its Line Post insulator with a new Lapp-engineered clamp-top. In this unit is a simplicity of design which makes for greatest ease and low cost in original installation . . . maximum security and convenience in hot-line changing of insulators . . . and all the safety and mechanical dependability of Lapp Post construction.



EASE OF INSTALLATION

In making the original installation, the Line Post, with clamp attached, is mounted on the crossarm (interchangeable stud bolts provide for mounting on any type of crossarm). Keeper cap screws are loosened, and one removed; the loose keeper is rotated—on the remaining cap screw—out of position. The conductor is then dropped into place, the keeper brought back into position, cap screw replaced, and both cap screws tightened. Cap screws have captive lock-washers, so there is *only one loose part* per insulator throughout installation.

CONVENIENCE OF INSULATOR CHANGE

To change out an insulator, the trunnion cap screw is backed off *(not removed)*, and conductor (with clamp still attached) lifted out of position. The insulator is changed, conductor and clamp slipped into position in the new insulator, and held by tightening trunnion cap screw. *No loose parts* throughout insulator change.

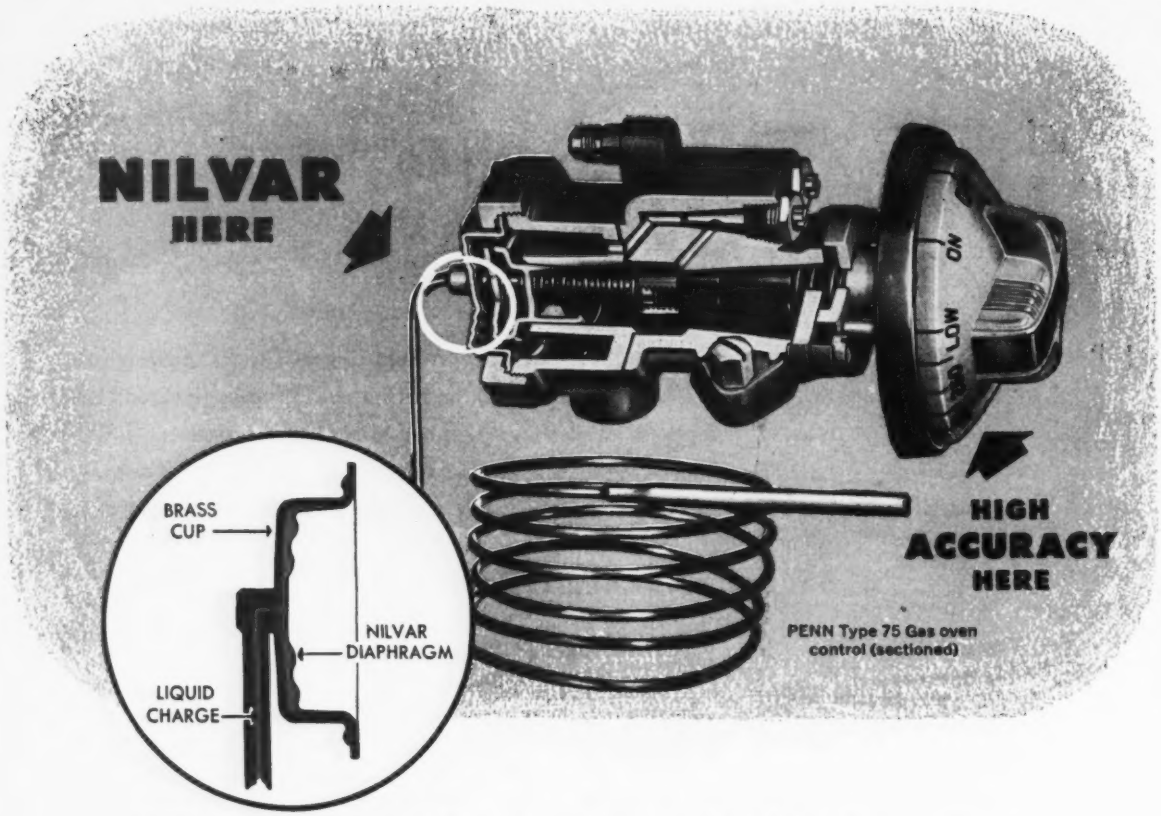
SAFETY AND MECHANICAL SECURITY

A fundamental concept of all Lapp Post design is external attachment of hardware. The clamp-top assembly is carried on a cap cemented onto the outside of the head of the porcelain post. This provides for loading of the porcelain only in compression. Elimination of bursting internal forces protects and safeguards porcelain life.

Lapp

** Lapp has repeatedly pointed out the merits of tie-wire attachment of conductors. As it has been used for many years, the simple tie-wire provides a sort of mechanical fuse or "weak link"—in case of a broken conductor, the conductor will slip through the tie-wire, to relieve crossarms and poles of excess load. The clamp-top insulator has the basic disadvantage of positive attachment to conductor —in case of a broken conductor, structure damage is almost certain.*

Write for specification data on clamp-top Lapp Line Posts at ratings 20 kv to 88 kv.
***Lapp** Insulator Co., Inc., Le Roy, N. Y.*



Nilvar* Alloy Makes New PENN Gas Oven Controls Self Compensating

By providing a self-compensating flexible diaphragm assembly for its liquid expansion controls, PENN Controls, Inc. compensates for ambient heat and eliminates control time-lag. Result: controls *accurately* maintain the temperature dialed.

The PENN Self-compensated Diaphragm assembly utilizes a brass retaining cup and a flexible Nilvar diaphragm to form a hollow chamber. This connects to the temperature bulb through a capillary tube, the entire unit being filled with a liquid charge.

Because brass expands much more than Nilvar, ambient heat *simultaneously* increases the volume of the chamber, when it increases the volume of the liquid charge. This self compensation reduces the effect of ambient heat on the diaphragm to zero and permits the diaphragm to respond *only* to bulb temperatures.

PENN specifies Nilvar for this application because it has a very low temperature coefficient of expansion —as low as .000001/C°— lowest of any alloy, and comparable to that of quartz. And its consistent uniformity helps maintain the high accuracy which PENN production standards require.

The remarkable dimensional stability of Nilvar may answer your engineering problems too. Why not talk it over with us. We'll be glad to make recommendations geared to your specific needs.

*T. M. Reg. U. S. Pat. Off.

Nilvar is produced only by

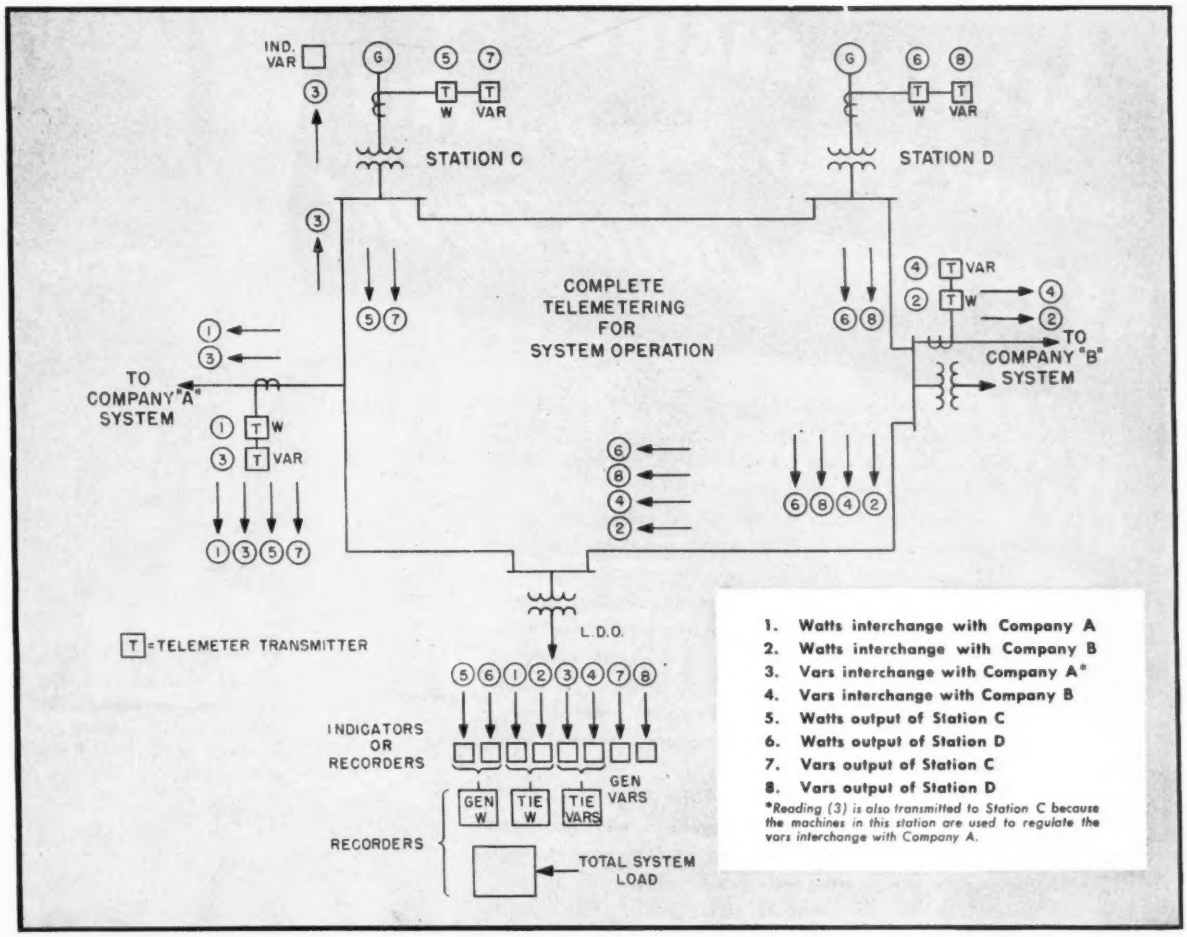
Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD


IND. VAR
STATION C
STATION D
COMPLETE TELEMETERING FOR SYSTEM OPERATION
TO COMPANY "A" SYSTEM
TO COMPANY "B" SYSTEM
L.D.O.
T=TELEMETER TRANSMITTER
INDICATORS OR RECORDERS
GEN VARS
GEN W
TIE W
TIE VARS
RECORDERS
TOTAL SYSTEM LOAD
1. Watts interchange with Company A
2. Watts interchange with Company B
3. Vars interchange with Company A*
4. Vars interchange with Company B
5. Watts output of Station C
6. Watts output of Station D
7. Vars output of Station C
8. Vars output of Station D
*Reading (3) is also transmitted to Station C because the machines in this station are used to regulate the vars interchange with Company A.

G-E Telemetering Provides Immediate Check of Entire Power Generating System

Above is a complete telemetering network for one generating system. The diagram shows how this network instantly supplies system load dispatches with eight essential checks on power generation.

Only continuous system-wide telemetering can bring you all of these essential readings: active and reactive power in the tie lines and other key points, generating station power and reactive power, loading of critical tie lines, and net power interchange.

G-E telemetering equipment is available for carrier-current channels, microwave channels and wire-line channels. You are assured of a completely co-ordinated system because all the equipment is designed, manufactured, sold, and serviced by only one company.

FAST RECORDER RESPONSE is available with the G-E telemetering system. With any nominal two-second electronic recorder, the response time is less than two seconds for 90 per cent of full scale.

Also, since indicating milliameters can be used when a record is not needed, the expense of charts and maintenance of narrow or wide chart recorders is limited to those places where recording is essential.

GREATER ECONOMY in use of carrier channels is provided because the maximum telemeter frequency is only 27 cps. This permits the use of narrow-bank, crystal-controlled carrier equipment for any frequency in the 30 to 200 kc range.

MORE ACCURATE, STABLE TRANSMISSION is assured by the wide range of the telemeter signal frequency (6 to 27 cps). Such telemeters are inherently less susceptible to transient channel disturbances.

For more information contact your nearest G-E apparatus sales office, or write for bulletin GEA-5746, Section 605-38A, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

SERVICE-ENGINEERED
For Faster SPEED...Greater SAFETY
KEYSTONE *Ladder Mount*

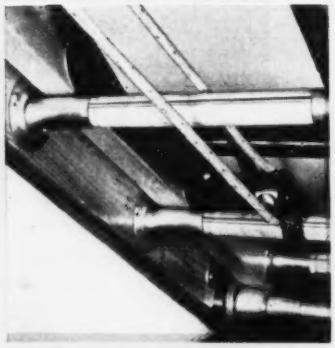
There's extra safety for your workmen . . . greater speed on every job . . . no delays or difficult "spotting," when a Keystone Ladder Mount handles your overhead work.

This quick-acting, ultra-safe ladder mount is *"service-engineered"* at every point for top performance on the toughest overhead jobs . . . *"service-engineered"* eight ways better, to give you faster operation, longer life, and lower maintenance costs. Can be raised or lowered in seconds . . . rotates through 360° at any angle . . . is easily operated by one man. Readily reaches over parked cars, road obstructions, without need to move truck.

All components of the Keystone Ladder Mount are of top quality, with seasoned spruce steel-trussed for extra strength and rigidity. Available in 24′, 28′ and 32′ sizes. Write for full details.

- ***EASY TO SPOT***
- ***FAST OPERATION***
- ***ONE MAN DOES THE JOB***

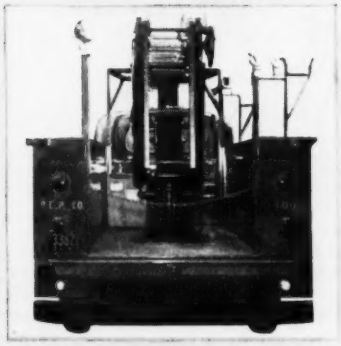
1. FASTEST RAISING and lowering of counterbalanced ladder is accomplished by quick-acting shielded springs. Sturdy steel vertical approach has knurled rungs for safe, sure footing.



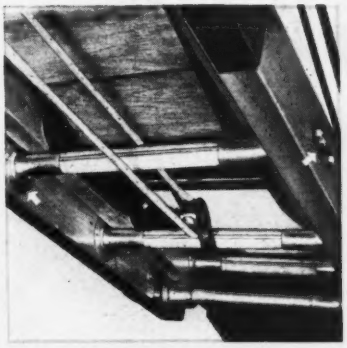
5. RUNGS REINFORCED underneath by metal tie bars for extra safety. Twisting and side play minimized by tube and flange combination at ends of rungs.

SERVICE-ENGINEERED by ELECTRIC SERVICE

ELECTRIC SERVICE MANUFACTURING CO.



2. SAVES TRUCK SPACE. Radius of mount is only 21" . . . leaves plenty of room for other equipment Mount can be easily removed by loosening only eight bolts.

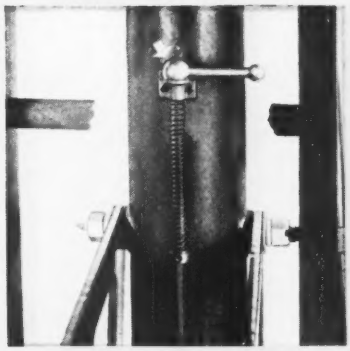


3. RUNGS EASILY REPLACED when worn, by removing the bolts holding the flanges and inserting new wooden rungs.

4. POSITIVE STRENGTH and safety are provided by strong wooden side rails, trussed and reinforced with steel "A" braces.

6. STURDY PLATFORM, with fast automatic operation, is fully adjustable . . . provides perfectly flat surface for safe, comfortable footing.

7. COMPLETE CONTROL of fly ladder is assured. Handwheel and windlass permit easy raising, hand-brake controls descent.



8. SAFETY LOCK . . . When workman is on fly ladder, lock against vertical movement cannot be unlocked.

Comparative tests conducted by leading utilities companies give positive proof that

KEYSTONE LADDER MOUNT

is superior in strength, safety and speed of operation.

Optional additional equipment includes safety marker lights, pilot lights, warning buzzer, or automatic switch to prevent truck movement while ladder is raised.

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

EXPERIENCE + MODERN FACILITIES METHODS THINKING MEANS "It MUST Be Right!"

Triangle's two plants—one making wire and cable in New Brunswick, New Jersey, the other making conduit in Moundsville, West Virginia, have kept pace through the years with every advancement and are completely modern in machinery and equipment.

When it comes to wire, cable or conduit, you want assurance that it's *right* — right in quality, right in performance. Triangle products *are* right! Triangle's *long experience* coupled with modern machinery, modern methods and modern thinking means "It Must Be Right!"

Triangle products are built to the highest possible specifications under the supervision of craftsmen who take pride in surpassing accepted standards.

Experience plus modern facilities, modern methods, modern thinking — that's why Triangle can say with confidence — "IT *MUST* BE RIGHT!" That's why you can specify Triangle and know that "IT *IS* RIGHT!"

THIS MAN WANTS TO HELP YOU!

He is your Triangle Distributor. In the same way Triangle offers quality *products*, your Triangle Distributor offers unexcelled *service*. See your Triangle Distributor *first*. In the long run you'll save and get it faster, from a Triangle Distributor.

The Trade Mark of Top Quality

TRIANGLE

IT MUST BE RIGHT!

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

When it's a Question of Carrying Electrical Power—Specify TRIANGLE

R&IE SUBSTATION STRUCTURES

from Design to Delivery

1. R&IE Substation Service is controlled and centralized at one source. One responsibility, under "one roof" for design, fabrication and application of Switching Equipment.

2. R&IE "know-how", verified by over forty years of dependable construction experience, produces a correct installation, mechanically and electrically.

3. The installation shown below required all-aluminum structural members, bolts and nuts. Fabrication and erection time can be greatly reduced with this kind of metal, and maintenance reduced to an absolute minimum.

R&IE SUBSTATION EQUIPMENT
DIVISION OF I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

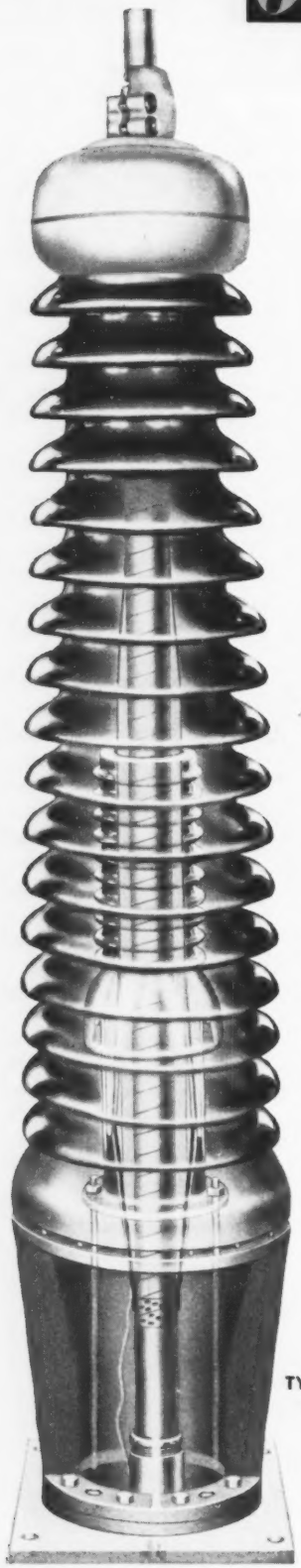
AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

Now it's G & W for OIL & GAS FILLED

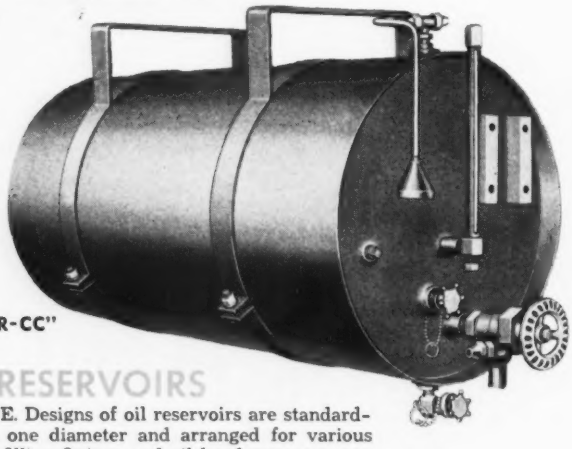
CABLE ACCESSORIES, up to 161 Kv., formerly made by General Electric Co. were turned over to G & W on January 1, 1953. Cable manufacturers and users are assured that G & W has the qualified personnel with the necessary engineering and manufacturing experience and production facilities for properly handling this category of equipment. G & W designs of potheads in this class have proved very satisfactory and will be continued. G & W has received the G. E. patents and drawings and is now in production on oil reservoirs, relays, spreader heads, gas cabinets, valves, tapes, oil, gas and compounds, and cable joint material kits. Design details have been revised where desirable to improve the devices—for example, pressure tight housings are now fabricated from sheet or spun metal instead of castings to eliminate possibility of leaks due to porosity.



TYPE "ATA"
161 Kv.

POTHEADS

Proper treatment of mechanical and electrical stresses permit the simple G & W design shown at the left. In this Type "ATA" pothead, full 200 pound pipe line oil pressure is retained by the relatively small bore porcelain shell. Stress relief cone, supplemented by porcelain stress control tube, makes efficient use of the internal diameter and length of porcelain shell—and reduces the amount of installation labor.



TYPE "R-CC"

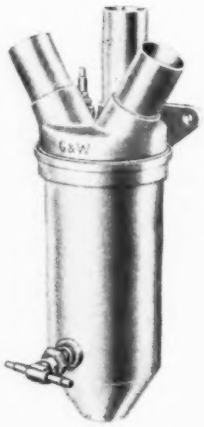
OIL RESERVOIRS

The G. E. Designs of oil reservoirs are standardized to one diameter and arranged for various valves, filling fittings and oil level gauges as required. Two styles of interchangeable brackets for ceiling, wall or corner mounting. The three types of reservoirs are available in sizes given below.

TYPE "R-AC"-Oil in tank, gas in sealed unit cells. For feeding oil into joints and potheads on "solid" oil filled cables. Sizes 3, 5, 10 and 15 gals.

TYPE "R-CC"-Oil in cells (manifolded to cable). Oil in tank, vented to atmosphere. Same purpose as "R-AC," but for conditions which permit the use of a gravity feed reservoir. Sizes 3, 5, 10, 15 and 20 gallons.

TYPE "R-DC"-Oil in cells (manifolded to cable), gas in tank. Balanced pressure type for feeding oil filled cables where gravity feed is not suitable. Sizes 3, 5, 10, 15, and 20 gallons.



SPREADER HEADS

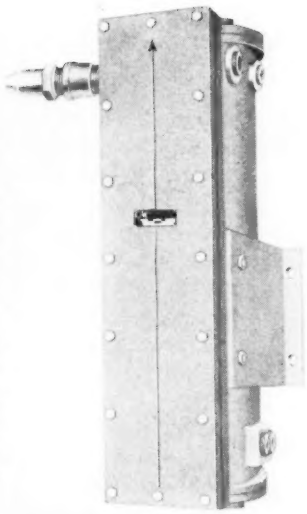
For use with 3 conductor, shielded, lead covered cables, solid, gas or oil filled paper insulated, which are to be terminated in single conductor potheads. Made in various forms, and sizes, the Type "SH" illustrated is a typical gasketless style.

CABLE ACCESSORIES

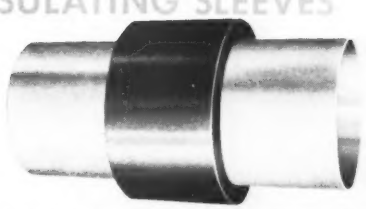
RELAYS

Relays, used in conjunction with alarm devices, give automatic warning of the existence of dangerous minimum or maximum pressure conditions. Simplified and improved functional relays of various designs are available for adaptation to the three types of oil reservoirs for low pressure oil filled cable systems—and for low, medium and high pressure gas filled cables.

The Type "EG" relay illustrated is for use with Type "R-CC" oil reservoir only. This relay has a steel ball float in a vertical brass tube and magnetic linkages which actuate the alarm circuit switches. The protective enclosure is bolted to the front of the "R-CC" reservoir.



INSULATING SLEEVES



To eliminate circulating sheath currents in large size single conductor cables, insulating sleeves are used in the cable sheath or as joint sleeves to break the continuity of the cable sheath. Sections between insulators are bonded and grounded at one point only. The resultant voltage induced on the sheath is kept within safe limits and the current carrying capacity of the cable is not affected by the sheath losses.

Insulating sleeves are available in the G. E. molded insulation type (illustrated) and in the G & W soldered porcelain type.

PIPE INSULATORS

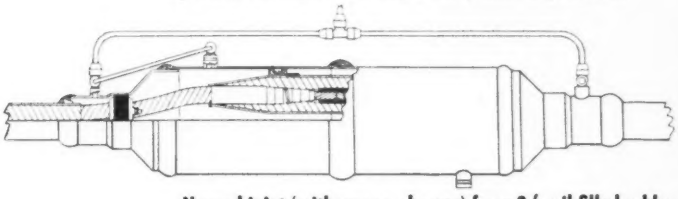
Pipe insulators, Bakelite, with flared fittings for $\frac{3}{8}$ o.d. copper tubing, are used to break the electrical continuity between reservoirs and cable joints or potheads.

TAPES, COMPOUNDS and OILS, GAS, CABINETS, VALVES and FITTINGS

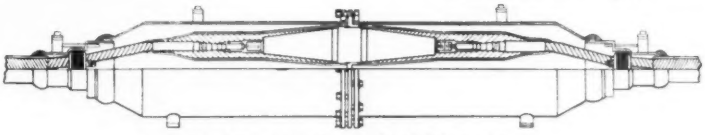
These materials and devices for use in conjunction with oil and gas filled cable terminations and joints are available from G & W for your convenience.

CABLE JOINTS

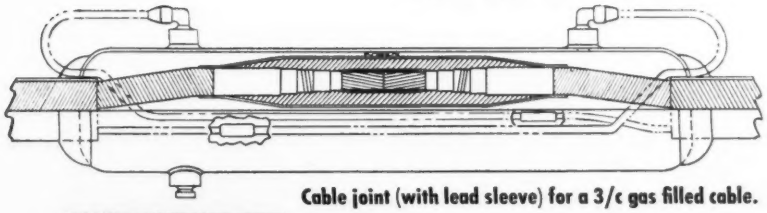
Carefully prepared designs and complete jointing material for all sizes and types of oil and gas filled cables are furnished by G & W. Joints are designed individually for specific cable installations. Simple construction from the standpoint of installation is an important consideration.



Normal joint (with copper sleeves) for a 3/c oil filled cable.



Typical stop joint for a 3/c oil filled cable.



Cable joint (with lead sleeve) for a 3/c gas filled cable.

Your orders and inquiries for oil and gas filled cable accessories received direct or through cable manufacturers will be given our careful attention.

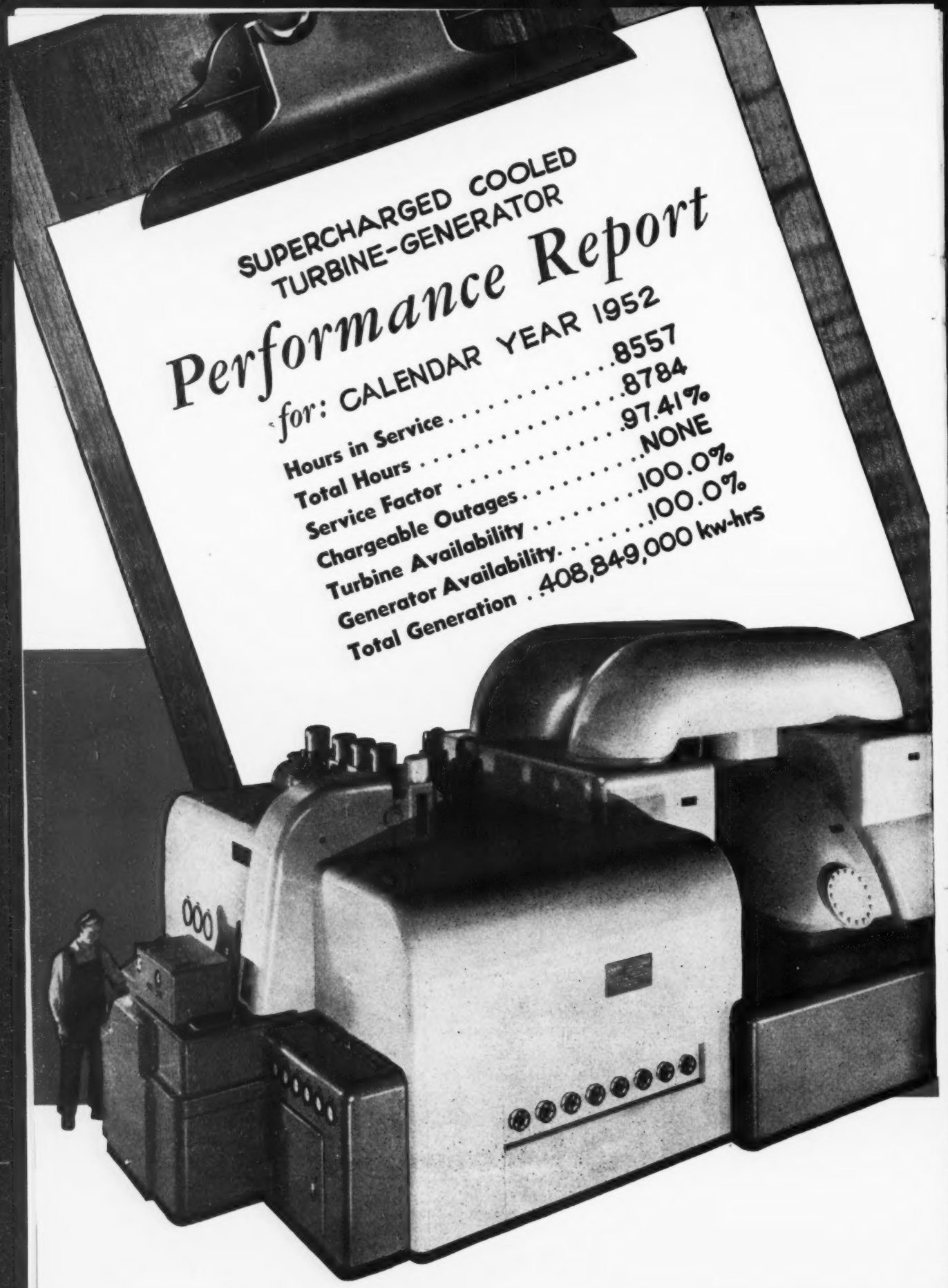
AT 531

G & W ELECTRIC SPECIALTY COMPANY

7780 DANTE AVENUE • CHICAGO 19, ILLINOIS

Cable Terminating, Connecting and Sectionalizing Devices Since 1905

Representatives in principal cities of U.S.A.—In Canada, Powerlite Devices, Ltd., Toronto, Montreal & Vancouver


SUPERCHARGED COOLED
TURBINE-GENERATOR
Performance Report
for: CALENDAR YEAR 1952
Hours in Service 8557
Total Hours 8784
Service Factor 97.41%
Chargeable Outages . . . . . NONE
Turbine Availability 100.0%
Generator Availability 100.0%
Total Generation . . 408,849,000 kw-hrs

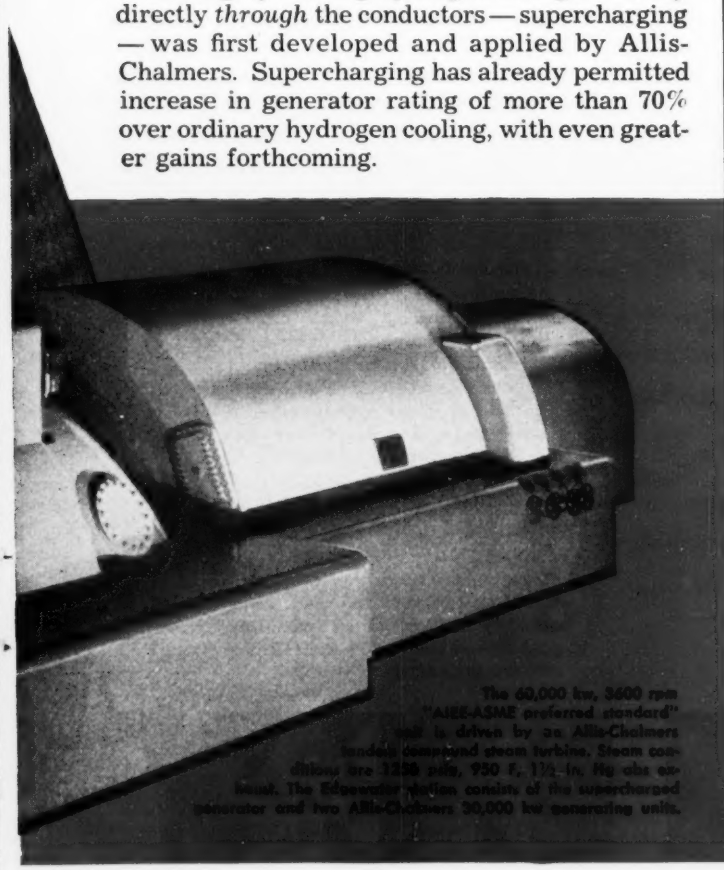
Availability for Duty: 100.0%!

Supercharged Hydrogen Cooling — the greatest advance *ever* made in turbine generator design — has proved itself brilliantly in its first full year's commercial operation!

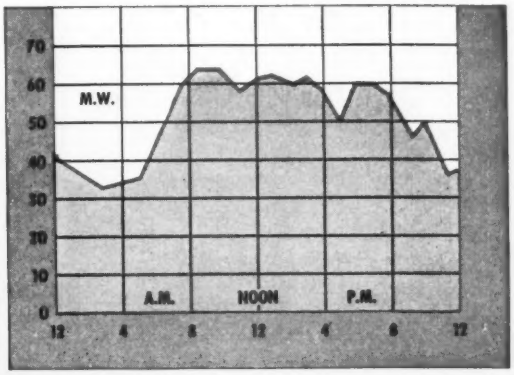
At left is the calendar year 1952 Performance Report on the Allis-Chalmers 60,000 kw steam turbine generator unit at the Edgewater station, Sheboygan, Wisconsin Power and Light Company. Both turbine and generator Availability were 100.0%, with on-the-line Service Factor over the entire year being 97.41%.

Cooling by driving hydrogen at high velocity directly *through* the conductors — supercharging — was first developed and applied by Allis-Chalmers. Supercharging has already permitted increase in generator rating of more than 70% over ordinary hydrogen cooling, with even greater gains forthcoming.

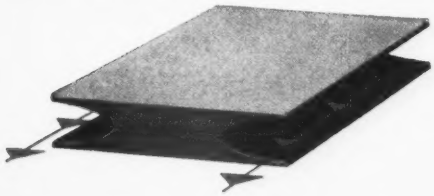
You get the real design advances *first* from Allis-Chalmers, builder of the world's widest range of power plant equipment. When planning a steam-electric power plant, your task will be simpler and results better if you deal with Allis-Chalmers. For complete literature on all products, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3981



The 60,000 kw, 3600 rpm "AIEE-ASME preferred standard" unit is driven by an Allis-Chalmers tandem compound steam turbine. Steam conditions are 1250 psig, 950 F, 1½-in. Hg abs exhaust. The Edgewater station consists of the supercharged generator and two Allis-Chalmers 30,000 kw generating units.



Typical daily load cycle of the Sheboygan supercharged unit. It experiences wide load fluctuations because it operates in parallel with base load hydro power. Supercharged units are suited for even this strenuous duty because of high part load efficiency and shorter, more thermally stable construction.

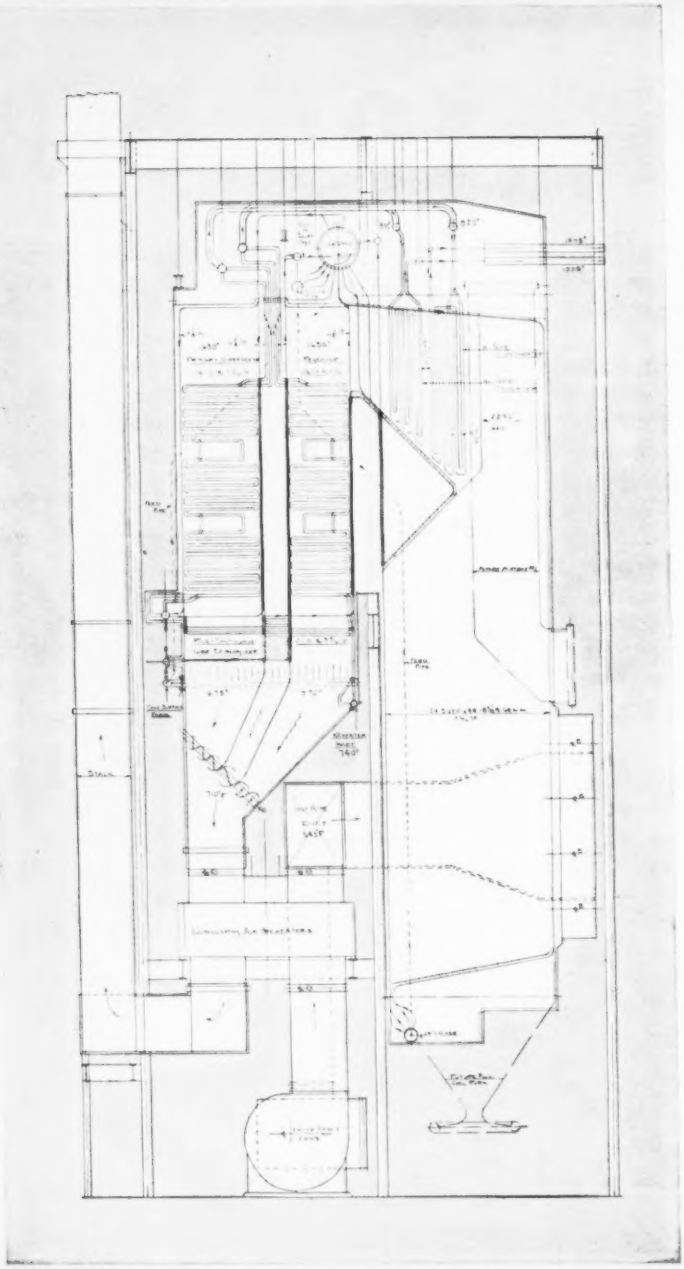


Cross sectional view, showing two turns of typical supercharged conductor construction. The cooling gas is in intimate contact with the copper, removing the heat right where it originates. The heat does *not* have to migrate through insulation and surrounding metal to reach vent ducts in the rotor teeth or body.

ALLIS-CHALMERS

FIRST with Supercharged Hydrogen Cooling!

TEXAS GOES FOR RILEY



RILEY REHEAT UNITS
recently purchased by

TEXAS ELECTRIC SERVICE CO.
DALLAS POWER & LIGHT CO.
HOUSTON LIGHTING & POWER CO.

Capacity—1,250,000 lbs./hr.
Design Pressure—2125 psig
Superheater Outlet Pressure—1925 psig
Steam Temperature—1005°F.
Reheater Capacity—1,148,000 lbs./hr.
Reheater Outlet Pressure—470 psig
Reheater Temperature—1005°F.
Efficiency, Gas Firing—83.7%
Pressurized Furnace
Fired by Gas—Oil Standby
Designed for future conversion to lignite firing
Ebasco Services, Inc., *Engineers*

Method of Steam and Reheat Temperature Control

Steam temperature is maintained constant between 900,000 and 1,250,000 lbs./hr. and reheater temperature between 825,000 and 1,148,000 lbs./hr. by means of gas flow control dampers.

Gas flows over superheater and reheater primary surface are automatically controlled by dampers located below the economizer. This provides definite control of both steam and reheat temperatures. The flow of gases over superheater and reheat surface is proportioned to give the desired temperature of 1005°F. from each.

At high loads where the quantity of gas passing over superheater and reheater surfaces would give higher than desired temperature, part of the gas is by-passed through the open lane between superheater and reheater surfaces. Note that the quantity of economizer surface in the bypass line is greater to give approximately uniform economizer exit gases.

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston Cincinnati · New York Charlotte · Philadelphia Atlanta Denver · Washington New Orleans Salt Lake City · Buffalo St. Louis Los Angeles · Pittsburgh Kansas City Portland · Cleveland St. Paul Seattle · Detroit Tulsa · Chicago Houston

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS

REHEAT UNITS IN A BIG WAY

★ TEXAS ELECTRIC SERVICES CO.

★ DALLAS POWER & LIGHT CO.

★ HOUSTON LIGHTING & POWER CO.

all have recently ordered 1,250,000 lbs./hr., 2125 design pressure, 1005°F. steam temperature and 1005°F. reheat temperature Riley steam generating units. These will be the first gas-fired reheat units to be installed in Texas.

While the Riley units purchased by Texas Electric Service Company and Dallas Power and Light Company are the first Riley units ordered by these companies, the two 1,250,000 lbs./hr. Riley reheat units purchased by Houston Lighting and Power Company will be the tenth and eleventh Riley units installed by them since 1938 and will give Houston over 7,000,000 pounds per hour capacity of Riley units.

When such a large public utility company places ten different orders with Riley extending over a 15-year period, isn't that conclusive evidence that Riley is a good company to do business with, that the performance of Riley equipment has been entirely satisfactory and that Riley gives their customers their money's worth.

It will pay you to investigate Riley equipment and request a Riley proposal when you are considering steam generating or fuel burning equipment. Riley users will assure you that you can rely on Riley.

Other Riley Public Utility Installations

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES, CALIFORNIA
1,200,000 lbs./hr. 2075 psig. 1000°F. and 1000°F. reheat.

LOUISIANA POWER & LIGHT CO.
1,000,000 lbs./hr. 1725 psig, 1005°F. and 1005°F. reheat.
Ebasco Services, *Engineers*

SOUTHWESTERN GAS & ELECTRIC CO.
630,000 lbs./hr. 1050 psig, 1005°F.
Sargent & Lundy, *Engineers*

MONONGAHELA POWER CO.
700,000 lbs./hr. 1050 psig, 905°F.
Sanderson & Porter, *Engineers*

UTAH POWER & LIGHT CO.
575,000 lbs./hr. 1700 psig, 1000°F. and 1000°F. reheat.
Bechtel Corp., *Engineers*

CENTRAL ILLINOIS LIGHT CO.
600,000 lbs./hr. 950 psig, 900°F.
Commonwealth Services, *Engineers*

NORTHERN STATES POWER CO.
385,000 lbs./hr. 1500 psig, 950°F.
Pioneer Service & Engineering, *Engineer*

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
460,000 lbs./hr. 1025 psig, 900°F.
Ford, Bacon & Davis, *Engineers*

THE POTOMAC EDISON CO.
700,000 lbs./hr. 1050 psig, 905°F.
Sanderson & Porter, *Engineers*

IOWA ELECTRIC LIGHT & POWER CO.
300,000 lbs./hr. 975 psig, 910°F.

GULF POWER CO.
325,000 lbs./hr. 1000 psig, 900°F.
Southern Services, *Engineers*

SOUTH CAROLINA GAS & ELECTRIC CO.
400,000 lbs./hr. 1475 psig, 955°F.
Gilbert Associates, *Engineers*

UTAH POWER & LIGHT CO.
620,000 lbs./hr. 1500 psig, 955°F.
Bechtel Corp., *Engineers*

IOWA-ILLINOIS GAS & ELECTRIC CO.
250,000 lbs./hr. 975 psig, 905°F.

PUBLIC SERVICE CO. OF INDIANA
400,000 lbs./hr. 1000 psig, 910°F.
Sargent & Lundy, *Engineers*

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES, CALIFORNIA
825,000 lbs./hr. 1200 psig, 900°F.

ARKANSAS POWER AND LIGHT CO.
650,000 lbs./hr. 1050 psig, 905°F.
Ebasco Services, Inc., *Engineers*

UNION ELECTRIC CO. OF ILLINOIS
370,000 lbs./hr. 1000 psig, 905°F.

SOUTHWESTERN PUBLIC SERVICE CO.
330,000 lbs./hr. 1050 psig, 900°F.

CAROLINA POWER AND LIGHT CO.
330,000 lbs./hr. 1025 psig, 905°F.
Ebasco Services, Inc., *Engineers*

PENNSYLVANIA ELECTRIC CO.
300,000 lbs./hr. 975 psig, 900°F.
Burns-Roe, *Engineers*

OHIO EDISON CO.
225,000 lbs./hr. 925 psig, 900°F.
Commonwealth Services, *Engineers*

MISSISSIPPI POWER CO.
230,000 lbs./hr. 975 psig, 860°F.
Southern Services, *Engineers*

WEST PENN POWER CO.
210,000 lbs./hr. 1000 psig, 910°F.
Sanderson & Porter, *Engineers*

INTERSTATE POWER CO.
200,000 lbs./hr. 725 psig, 910°F.
Sargent & Lundy, *Engineers*

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

Clarence Springer introduces you to---

BUILDING BIG BUSHINGS is a small part of Clarence Springer's job. His major job . . . the job that takes most of his time and ability . . . is seeing to it that Locke insulators remain well ahead of the field . . . in efficiency of product design . . . and reliable performance. With men of Clarence Springer's experience standing behind the performance characteristics of Locke insulators, is it any wonder that leading utilities prefer them . . . specify Locke at every opportunity!

Designed and built by LOCKE

"...picked for the job," says Clarence, "because of Locke's success with similar projects...and because of its extensive research, test and manufacturing facilities."

"Rarely," says Clarence, "has a manufacturer of electrical porcelain insulators been assigned a job as unusual and exacting as that of designing and building this big, complicated antenna lead-in bushing. To the best of my knowledge," he says, "it's the only bushing of its size and type in existence."

As Clarence tells the story, "Since nothing like it had ever been built before, plenty of original research and development work was required."

"However," says Clarence, "special assignments involving extensive research never seem to bother us. Our big advantage is the fact that our insulation research, test and manufacturing facilities are among the world's finest and largest."

"These facilities give us the tools with which we can lick the toughest kind of problems in porcelain engineering."

"Our success with special projects like this," says Clarence, "must be comforting to users of Locke Suspension, Switch, and Pin Type insulators. As I see it, a fellow can relax when he knows that the same skills, facilities and experience which produced this bushing . . . are always at work building reliable performance into the Locke insulators already on his lines, or on order."

"Leading utilities seem to feel that way about it," observes Clarence. "Judging by the number of insulators going out of here every year, you get the impression that utilities have practically unlimited confidence in Locke insulators. And," adds Clarence, "this confidence is well placed. Utility Service records prove it."

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

---GIGANTIC 3-TON BUSHING

"Probably the world's biggest bushing," says Clarence, "and truly a marvel of porcelain engineering."

Type: Antenna lead-in bushing.

Weight: 6,500 lbs.

Overall Length: 26 feet.

Flashover: 60 cycle dry and wet flashover voltage of either end nearly the same . . . about 750,000 volts.

Internal Dielectric Strength: At least 350 kv. and capable of operating at 300 kv. low frequency radio voltages . . . corona free up to breakdown voltage.

Internal Insulation: Dry nitrogen under pressure holding dielectric losses to minimum.

Bushing Interior: Aluminum alloy tube 10¼" outside diameter by 24 feet long runs entire length of interior. Six copper conductors, with neccessary parts, occupy inside of tube.

Shielding: Combination rain, falling ice and corona shield has 8-foot diameter. Tubular outer ring of corona shield 10" in diameter at its cross section. Shield keeps upper half of top porcelain dry with rain falling at 45° angle.

Top of Bushing: (outdoor part)—About 10 feet long. Made of two porcelain parts clamped together at flange. Tapers from 14½" inside diameter at small end to about 30" inside diameter at bottom end.

Indoor Part of Bushing: Like top except porcelains are inverted with petticoats sloping toward small end.

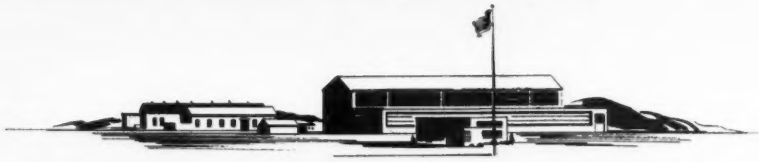
Metal Parts: All of non-magnetic material to keep electrical losses at a minimum. Bolts, nuts, washers of stainless steel. All other parts of either cast or wrought aluminum, copper conductors excepted.

Note: Bushing is shown in test frame in the Fred M. Locke High Voltage Laboratory.

From B&W Research & Engineering . . .

	EFFICIENCY	MAINTENANCE
CYCLONE STEAM SEPARATOR	• Simplifies attainment of higher pressures for greater cycle efficiency.	• Simple construction. • No pumps, motors to maintain. • Less chance of having burned-out tubes. • Less carry-over deposit on superheater tubes. • Cleaner turbines. • Fewer turbine outages.
DIVIDED FURNACE CONSTRUCTION		

From B&W Research & Engineering . . .



important answers to rising costs

By assuring adequate and positive circulation, B&W's Cyclone Steam Separator has made possible higher steam pressures, greater turbine efficiency, and has facilitated the use of Divided Furnace Construction to reduce material costs and keep boiler and building volume to a minimum. These engineering advances make possible cost and operating savings enjoyed exclusively by operators of B&W central station and industrial boilers. The chart below suggests many of these savings . . . all merit serious consideration in your evaluation.

We will be pleased to discuss these and other practical developments of B&W Research and Engineering as they relate to your power generation program and facilities. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX
BOILER DIVISION

G-598

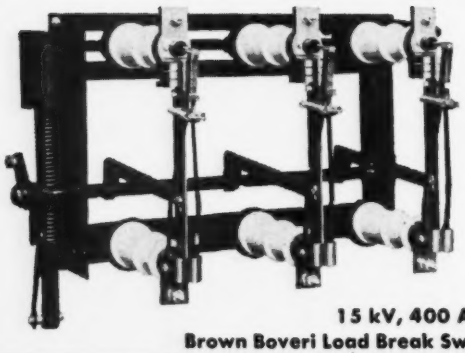
AVAILABILITY	AUXILIARY POWER	INITIAL COST	ACCEPTANCE
• No unnecessary restrictions in water flow path. • Consistent high steam purity. • Positive circulation to all circuits. • Fewer tube burn-outs.	• No power required for circulation.	• No pumps, motors or connections.	The simple, highly efficient Cyclone Steam Separator has been proved in thousands of central station and industrial installations . . . has made possible B&W's singular success with high pressure boilers. In the range over 2000 psi, more than 14 B&W boilers are in operation . . . some with records extending over 14 years . . . and an additional 60 units are being built.
• Reduces slagging in furnace and convection surfaces.		• Greater cooling surface without increasing furnace volume reduces steel and other material costs by keeping boiler and building volume to a minimum. Lowers furnace construction costs. Saving in boiler cost.	Long term central station operation at boiler design pressures as high as 2650 psi, has proved the cost-saving advantages of B&W's Divided-Furnace construction in all types of large units. Many of the more than 95 B&W Divided-Furnace Boilers in operation have been in service for over 12 years, and more than 90 additional units are now on order.

BROWN BOVERI LOAD BREAK SWITCHES

are guaranteed for

500 FULL CURRENT INTERRUPTIONS

with no contact replacements



15 kV, 400 Amp
Brown Boveri Load Break Switch

Designed for substation and branch line service, a Brown Boveri Load Break Switch requires no outside air supply. Its own switching movement generates the necessary compressed air to quench the arc and eliminate scorching of contacts . . . hence, no danger of fire, explosions or fumes.

High Operating Speed—High Breaking Capacity. These switches are available for 7.5 kV, interrupting 10,000 kVA; and 15 kV, for interrupting 15,000 kVA. They will handle magnetizing and line charging currents without restrikes. Primarily supplied for indoor service, they are also available in a steel housing for outdoor operation.

WRITE FOR DATA—MAIL COUPON TODAY

Brown Boveri Corp., 19 Rector St., N. Y. 6

Please send me complete data on Load Switches.

Name..... Title.....

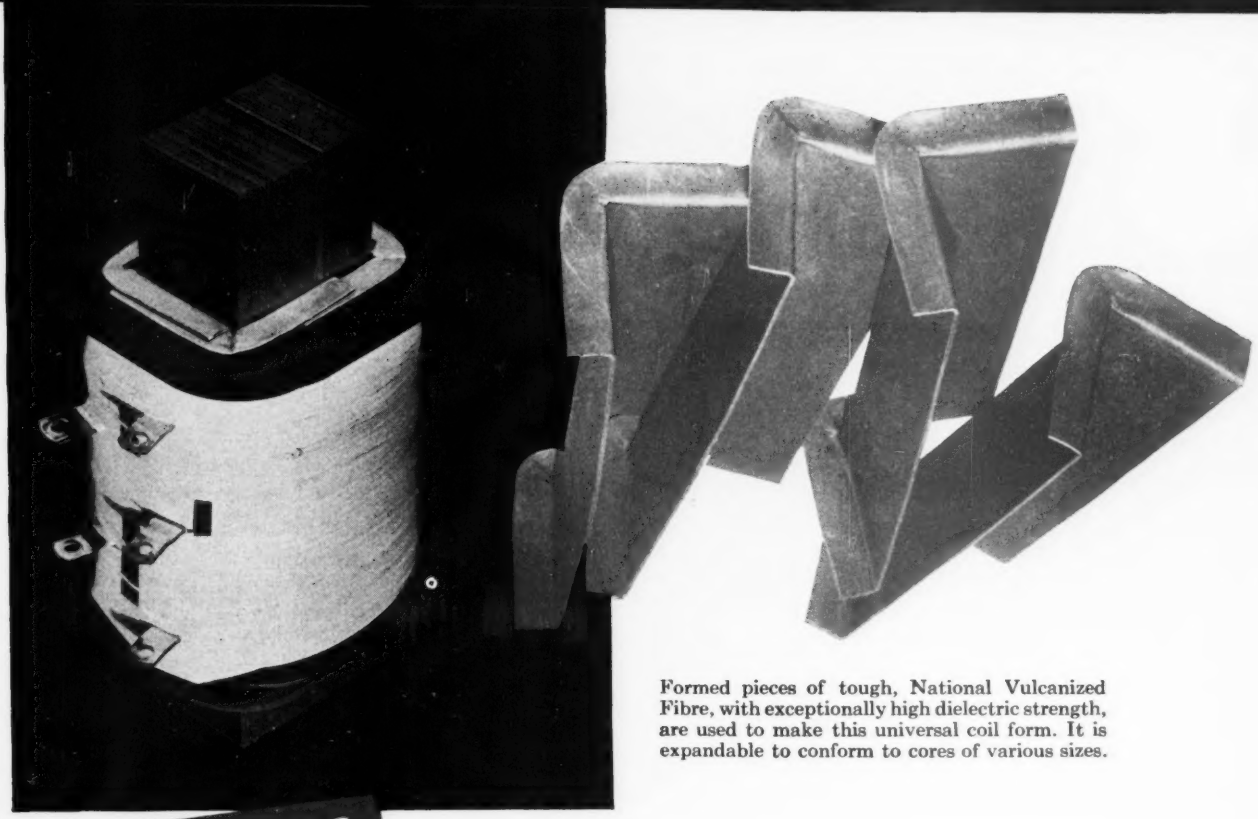
Company.....

Address.....

.....

BROWN BOVERI

BROWN BOVERI CORPORATION
19 RECTOR STREET, NEW YORK 6, N. Y.



Formed pieces of tough, National Vulcanized Fibre, with exceptionally high dielectric strength, are used to make this universal coil form. It is expandable to conform to cores of various sizes.

NATIONAL VULCANIZED FIBRE

contributes to an improved product—in universal coil forms for Cutler-Hammer, Inc.

This practical use of National Vulcanized Fibre by Cutler-Hammer, Inc. in their wire spools is typical of the countless contributions National Vulcanized Fibre—*the material of a million uses*—makes to business and industry.

In the electrical field National Vulcanized Fibre has been the standard insulation for years. It has high dielectric strength and, when subjected to hot electrical arcing, it evolves neutral gas which extinguishes arc without "tracking." Many electric appliances find National Vulcanized Fibre to be the one best material for one or more of their parts.

National Vulcanized Fibre applications, both mechanical and electrical, are varied and extensive. In mechanical applications it is desirable because it possesses exceptional tensile and crushing strength, toughness, density and resistance to wear—coupled with ease of fabrication. It actually improves with age; for many mechanical purposes it is better, more durable than metal.

Available in various grades and colors; and in sheets, rods, tubes and special shapes. Write for detailed literature and engineering service information—

NATIONAL VULCANIZED FIBRE CO.

Wilmington Delaware

Offices in Principal Cities

Since 1873

National Laminated Plastics
nationally known—nationally accepted

"Toughest operating but the first batch of

THIS IS A TYPICAL DRILL. It uses a 4-conductor No. 8 Amerclad cable.

Says Chief Electrician, Hudson Plant,
Universal Atlas Cement Company

● Year after year, at this quarry, the Amerclad is exposed to knife-sharp fragments of flying rock. During the summer, the rock often gets so hot that you can't even touch it. Other times, the cable lies out in the rain and snow— often at sub-zero temperatures.

At the Hudson, N. Y. quarry of Universal Atlas, Chief Electrician Frank Rodmond said, "This Amerclad runs the constant danger of being hit with flying rock fragments through secondary blasting. Yet the down-time cost of this operation is so high that we just can't stand cables that keep failing. We kept that last batch of Amerclad 12 years before we replaced it, yet it was still serviceable when we switched over to new Amerclad."

If you want service like this, specify Amerclad the next time you need cable that can really take it. Amerclad is available in a great many sizes and constructions, with or without shielding. There is a type to power anything from a river dredge or mine locomotive down to a rough and tumble electric hand drill. *Send the coupon,* and get more information.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

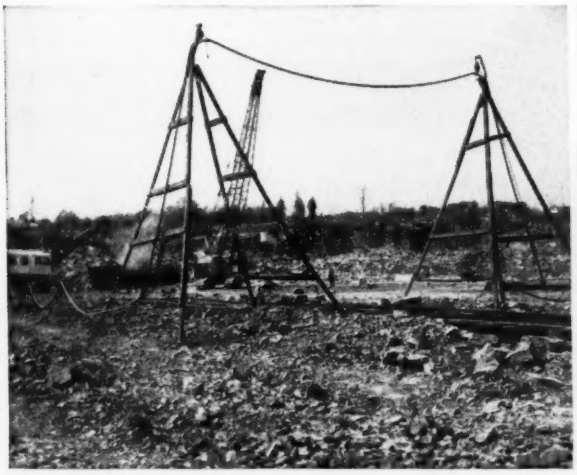
A STANDARD Cable for

- **paper & varnished cambric cable**
- **asbestos wire and cable**
- **aerial, underground & submarine cable**
- **shovel & dredge cable**

U·S·S AMERICAN ELECTRICAL

condition in our quarry— Amerclad lasted 12 years"

NOTICE THE CABLE TRAY fastened to the shovel. This was developed by Universal Atlas for easier cable handling—it also prolongs life of the cable.



HERE A CABLE is raised on horses to clear the railroad track. It feeds the shovel visible in background.

TWO WORKMEN WATCH from blast shelter as charge is set off in distance. Low horses cushion cable from shock of falling rock in secondary blast areas.

every **SPECIAL** *Job!*

- mold cured portable cord
- machine tool & building wire
- special purpose wire & cable

WIRE & CABLE

SEND THE COUPON

American Steel & Wire Division
Room EE-43, Rockefeller Building
Cleveland 13, Ohio

☐ Please give me more information about Amerclad.
☐ I'd like to talk to your representative.

Name .....

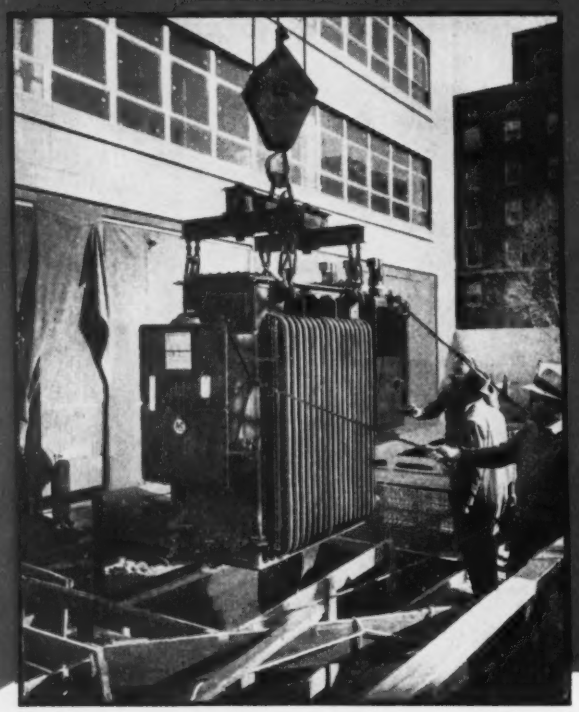
Firm .....

Address .....

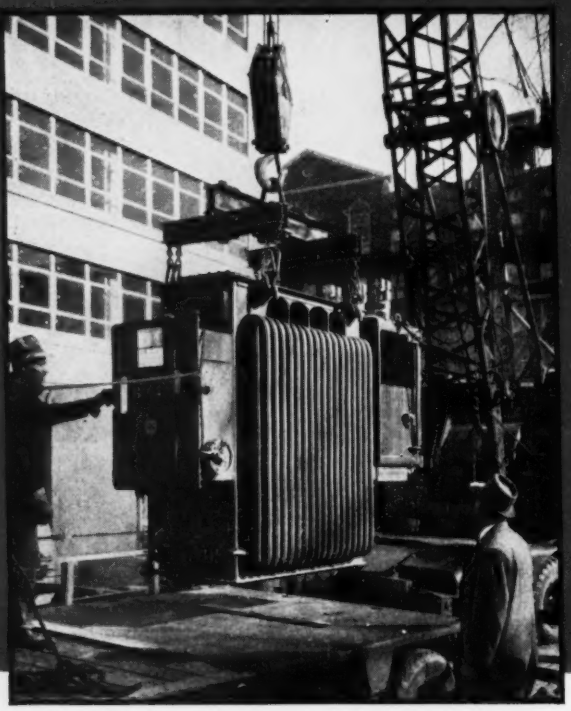
City ..... State .....

USS

UNITED STATES STEEL



1 **New Network Transformer Installation** provides principal power supply for new office building. Pictures show transformer being moved to site and being installed.



2 **This 750-kva Network Transformer** will supply all electrical service except for air conditioning motors. Location is at junction of Connecticut Avenue and "K" Street, 4 blocks from White House.

A Network Transformer Goes to Washington!

ALLIS-CHALMERS TRANSFORMERS USED ON POTOMAC ELECTRIC'S SYSTEM

Allis-Chalmers is proud to help serve on the fine network system of the Potomac Electric Power Company. Having had 15 years' experience with Allis-Chalmers network transformers, this utility has found them to give highly efficient performance.

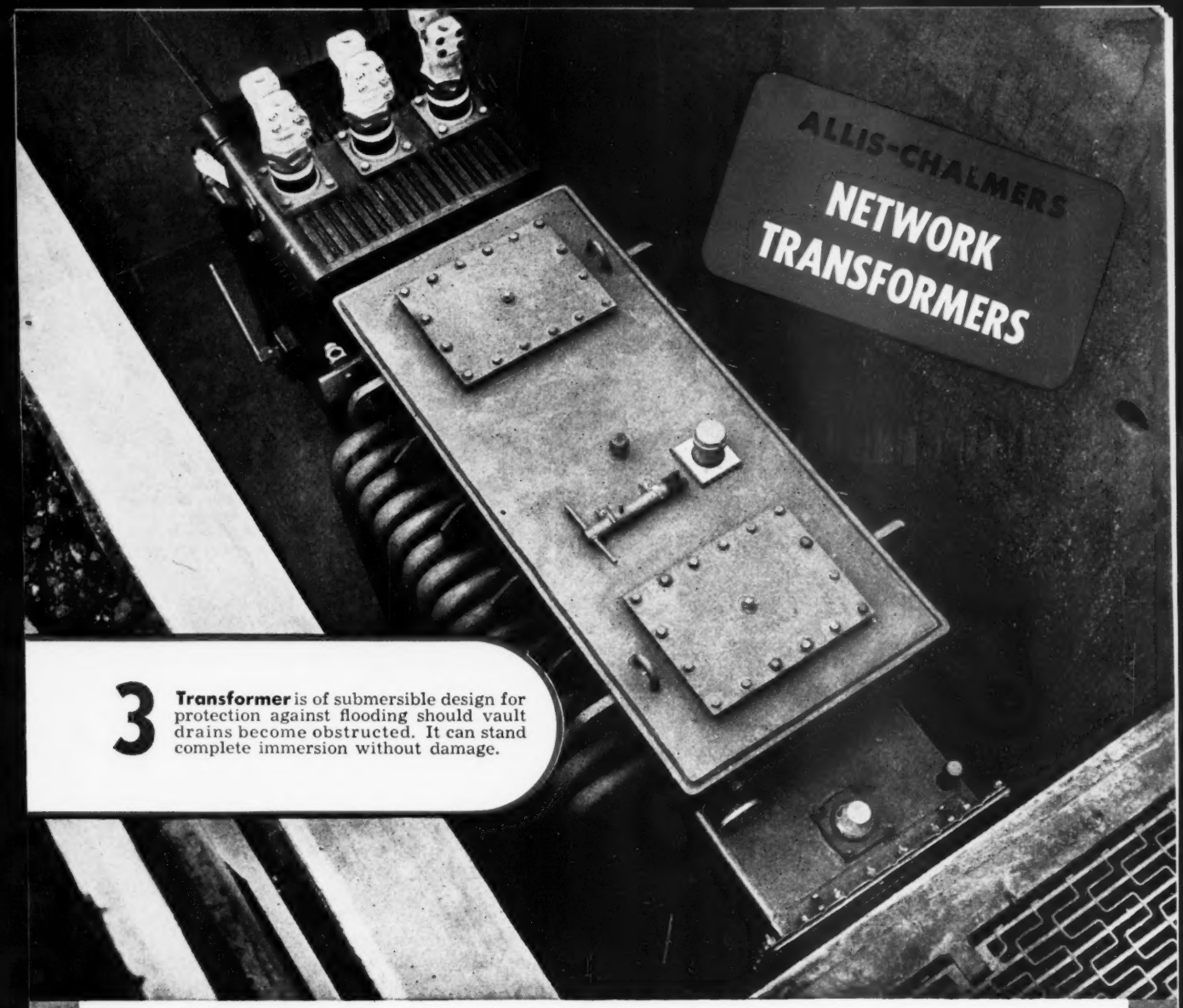
Excellence in construction detail is a major reason why Allis-Chalmers network transformers are chosen by so many utilities. Over 1¼ million kva of these units are now serving the nation's most important systems. Compact, low-loss design and high thermal capacity of Allis-Chalmers network transformers meet the severest load conditions.

See your nearest A-C district office for more details or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4010

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



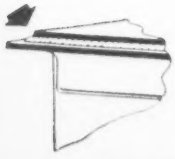
3 **Transformer** is of submersible design for protection against flooding should vault drains become obstructed. It can stand complete immersion without damage.

Here are Reasons Why the System Will Benefit

Spiral Wound Gaskets Are Performance Proved

In over 5 years of continuous use, spiral wound gaskets have proved their superiority over other types of gasket material for sealing bushings in the tank wall.

Alternate plies of preformed spring-like metal and non-metallic fillers provide unusual resilience that actually adjusts itself to changes in operating conditions. This gasket, installed without the use of cements or grease, simplifies the removal of bushings if required. The gasket may be re-used if necessary.

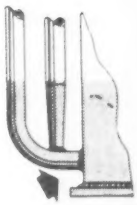


Weld-Seal Construction Eliminates Major Gaskets

The main cover and switch compartment are welded to the tank to eliminate leaks. Oil sludging and oxidation of insulation is minimized.

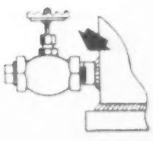
Special Surface Treatment Provided

Areas that may be exposed to severe corrosive conditions are thoroughly protected. Tank surfaces are grit-cleaned and given three coats of baked-on phenolic paint (formulated for moisture resistance). A special bituminous compound gives added protection to surfaces and tubes in base areas.

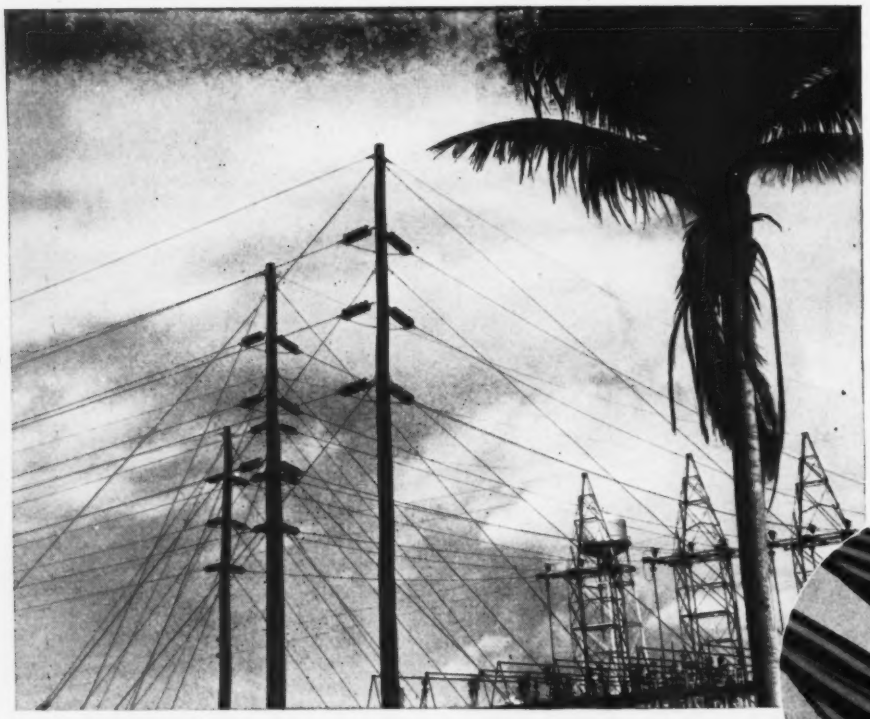


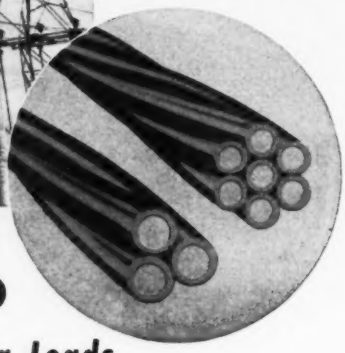
Threaded Valve Connections Are Solder-Wiped

Threaded valve connections are solder-wiped for extra protection. Valves are located for maximum accessibility. Globe type valves with non-rotating seats close tight, avoiding wear on valve seats.



POWER LINES ARE BUSY IN FLORIDA . . .





Copperweld Wire and Strand are permanently protected against corrosion. Each wire has a thick copper covering inseparably Molten-Welded to a strong alloy steel core.

Live Wire Utility Uses Non-rusting Copperweld® STRAND *To Support Increasing Loads*

Florida's rapid growth during the past 20 years has been little short of phenomenal. For example—population has more than doubled and industrially it is growing even faster, the number of manufacturing firms having increased 100% in the last five years.

To supply vital electric service for this expanding population growth, Florida Power & Light Company is constantly enlarging its facilities. Since VJ-Day alone, FP&L has nearly tripled its generating capability, built 4,837 miles of new lines to serve 207,630 new customers. Plans call for tripling its service within the next 10 years.

Since 1932, Florida Power & Light Company has used non-rusting Copperweld* Guy and Messenger Strand for dependable, economical overhead line construction. This progressive utility has found that once Copperweld is up, it's up to stay.

Today, in all parts of the world, many power companies, railroads and communication systems are relying on Copperweld Wire and Strand to give their overhead lines permanent, trouble-free operation at lowest annual cost. That's because each Copperweld Wire has a thick copper covering which permanently protects the high-strength steel core against rust and loss of strength. Thus, maintenance and replacement costs are eliminated; maximum continuity of service is assured.

Write us today for your copy of the Copperweld Engineering Data Book.

*Trade Mark

COPPERWELD STEEL COMPANY
Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES

Copperweld® NON-RUSTING
GUY AND MESSENGER STRAND

This is Carroll Roseberry* Manager of the Westinghouse Electric Utility Department, who will take you through the following pages, all of which have an important bearing on—

How product design advances relate to system protection, investment or growth

*Mr. Roseberry, as coordinating head of the company's Electric Utility efforts, is constantly working with product division experts . . . members of the Westinghouse team . . . who devote full time to the solution of *your* basic problems.

"Here's John Carlson, Manager of Engineering, Steam Division, to tell you about the importance of one turbine component as it relates to high capital investment."

YOU CAN BE **SURE**...IF IT'S

New 25″ turbine blade . . . raises kw capacity of 3,600-rpm units 25% . . . reduces cost per kilowatt

The new 25″ turbine blade is the result of 25 years of Westinghouse development of exhaust-row turbine blading. It reflects the importance of high-quality turbine components in meeting the demand for higher unit ratings. The new blade makes still greater generating economies possible.

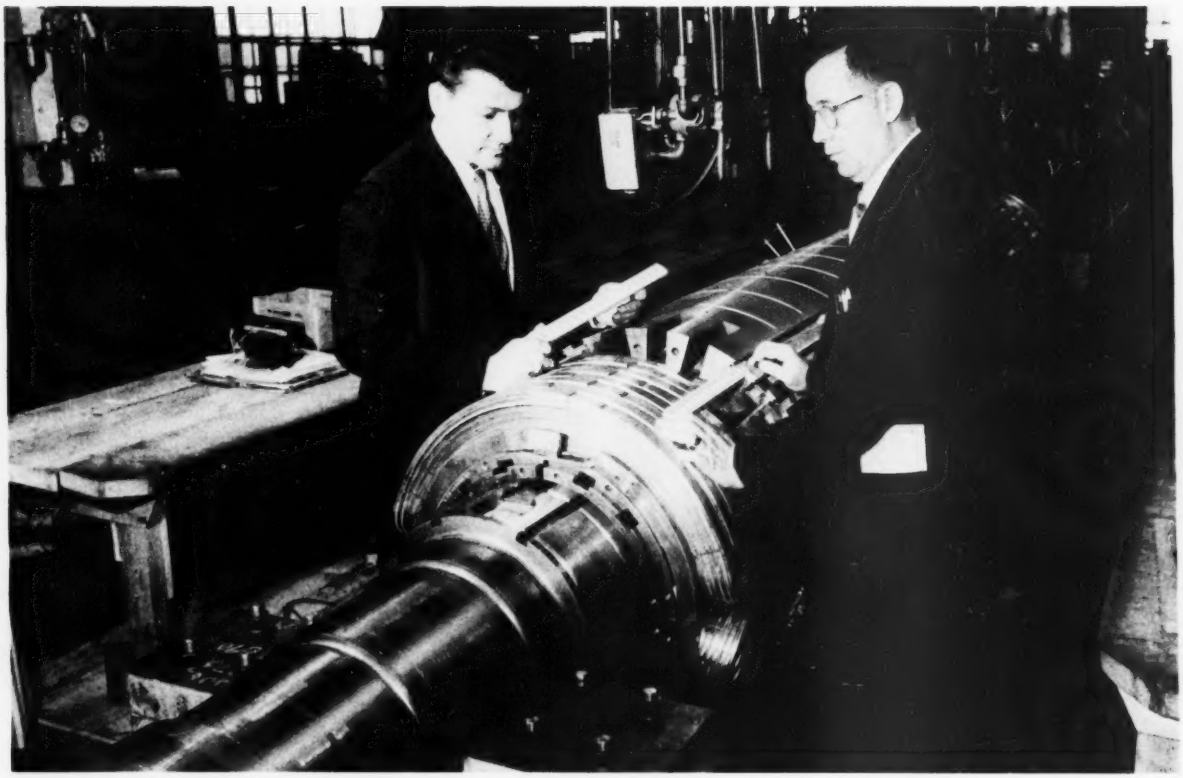
These blades, mounted on a larger diameter disc, produce a 25% increase in turbine capacity through increased steam-flow exhaust area. By using 3 sets of these blades, a 250,000-kw turbine generator is being built on a single shaft. Such construction saves over 600 tons of metal alone! In addition, smaller cranes and lighter foundations are required. The end result—important reductions in cost per kilowatt.

Paralleling this advance in blade design, the development of inner-cooled generators has contributed equally to this increase in 3,600-rpm turbine-generator unit rating. The consistent Westinghouse standard of high quality in every component assures continuing protection to your capital investment.

Perhaps your long-term generation investment needs a careful analysis. Start by calling your Westinghouse Representative, he's backed by a wealth of engineering and technical assistance . . . all of which is available to you.

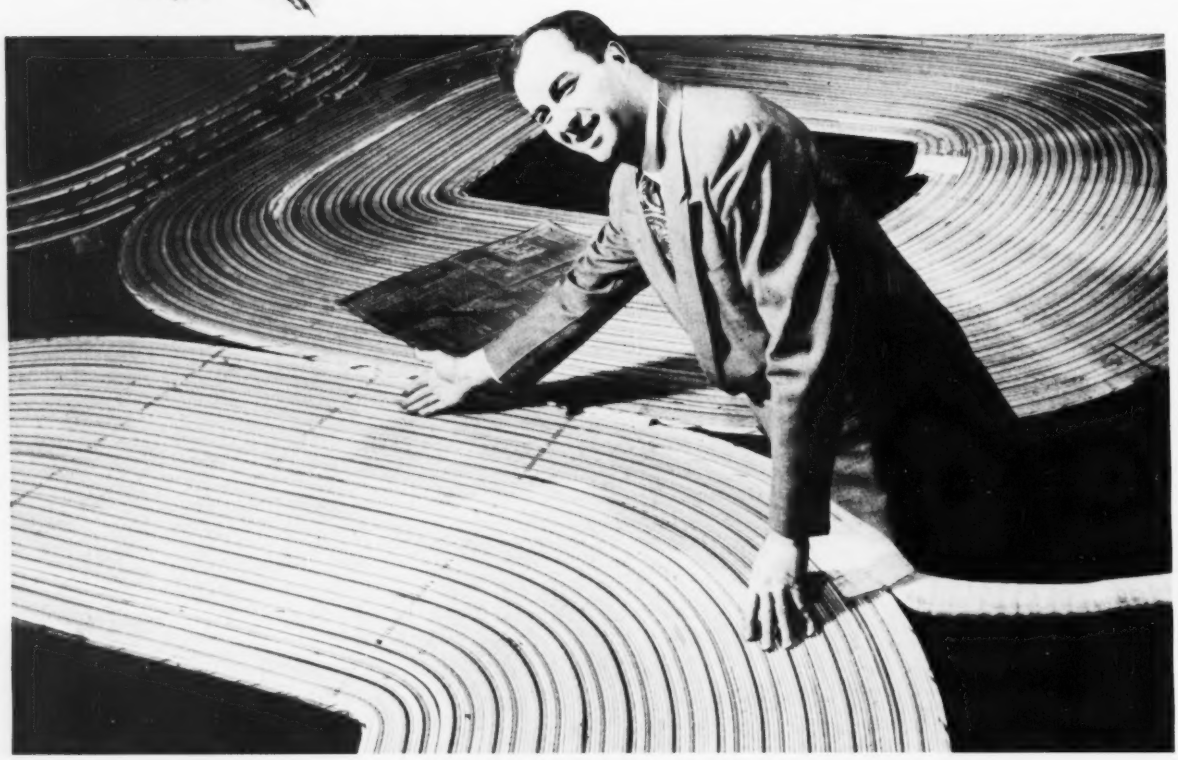
J-50551

Westinghouse Inner-Cooled Generator Design places coolant in contact with materials in which heat is generated. Here, engineers examine end turns of rotor for new inner-cooled, 100,000-kw generator now under construction.



Westinghouse

"John Cross of the Transformer Division says quality starts with basic design in large power transformers."*



Inherent protection of Westinghouse Transformers is based on simple physics

$s = \frac{P}{A}$ This simple unit stress formula expresses a fundamental in power transformer design: the greater the surface area, the smaller the psi force. By utilizing this in coil sections like the one shown here, Westinghouse Form-Fit Transformers not only give you improved physical properties, but better electrical characteristics as well.

Here's how:

Greater short-circuit capacity. When the magnetic stress of short-circuit surges tends to push coil sections apart, the force is minimized to low psi value because of the wide area over which it is distributed. This results in inherent coil insulation protection by maintaining a compact structure.

High impulse strength. Broad surface areas produce high coil-to-coil and low coil-to-ground capacitance. Thus, initial distribution of surge voltages through the winding is excellent, reducing unit stress and the magnitude of subsequent oscillations.

Plus superior cooling. The pancake-type coils, standing in a vertical plane, form natural flues for rapid circulation on *both* sides of each coil, resulting in low-temperature gradients. This provides a greater cooling margin for overloads. Form-Fit construction is ideal, too, for forced-oil cooling. Since directed oil flow is inherent in the design, no baffles or other artificial devices need be introduced.

Important as these advantages are, they cover only part of the reasons why you can expect better protection for your capital investment with Westinghouse Power Transformers. Ask your Westinghouse Representative for further details, or write for Booklet B-4142A.

J-70686

*Manager, Power Equipment Section

YOU CAN BE SURE...IF IT'S

"A. W. Hill and J. W. Stirling of the Switchgear Division show how inherent quality affects the largest breaker ever built."

Interrupts 25 million kva . . .

basic Westinghouse Breaker design made it possible

This is "Big Ben", the world's largest circuit breaker. It can interrupt 25 million kva on a 330-kv system.

"Big Ben" has the *same* basic quality features available to you on all Westinghouse Power Breakers. The 25,000,000-kva arcs will be extinguished in famous Westinghouse "De-ion®" grids. Self-generated oil flow interrupts medium and high currents and mechanically pumped oil interrupts load and charging currents . . . all in three cycles.

Note that "Big Ben" is of the "Watchcase" design, now standard on large Westinghouse Power Breakers. This cuts the oil requirements in *half*. Watchcase design was made possible because Westinghouse De-ion grids limit the tank pressure to low values, eliminating need for the conventional larger volume, round tanks.

Like other Westinghouse Power Breakers, "Big Ben's" operating mechanism has a very important advantage: it is mechanically trip free. The contacts will open instantly whether or not there is pressure in the cylinder. Another important factor is simplicity of the operating mechanism—for example, latch adjustment has been eliminated entirely.

The bushings in "Big Ben" would be undesirably larger were it not for the Westinghouse condenser principle which provides high insulation value in smaller space. Radio interference is *nonexistent.*

"Big Ben" and the other power breakers Westinghouse builds are the result of 28 years of High Power Laboratory testing and development, the value of which has been proved by thousands of breakers in service—experience that cannot be duplicated. Write us now for more information on power breakers. J-60819

Westinghouse

"J. T. Thompson, Manager of Switchgear Assemblies, believes it takes all of these factors to really protect your investment."

YOU CAN BE **SURE**...IF IT'S

In Westinghouse Switchgear . . . ceramic-lined chutes tame arcs . . . protective treatments combat corrosion

Metal-Clad Switchgear is under constant attack—inside and out. An arc might be compared to a small electric furnace—blasting at the chutes and contacts. So Westinghouse lines arc chutes with a true ceramic material containing a high percentage of *zircon*. Zircon has the highest melting point of any known material. Westinghouse Arc Chutes will not absorb moisture. They have high dielectric properties comparable to porcelain.

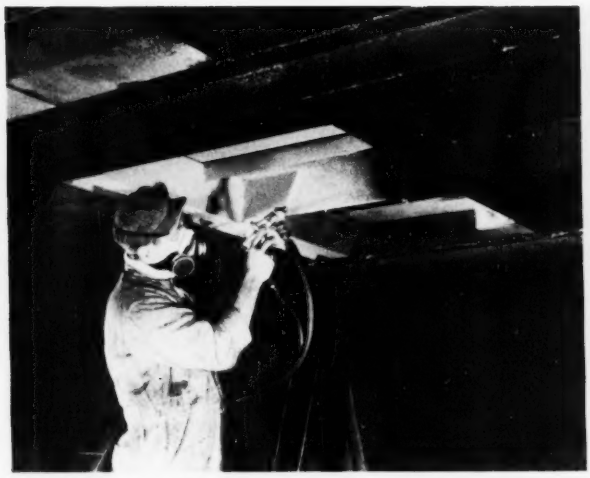
This switchgear employs the most effective method of arc extinction in use today. Extinction takes place in split seconds and the arc is on the main contacts for only a fraction of this time. Result . . . less contact burning, less chute wear, less shock to the whole unit.

The best practical surface protection we know of is Bonderizing. We Bonderize our metal enclosures *after* they're assembled so that every nook and cranny gets the full five-dip treatment. Then the enclosures are painted twice, and the paint sticks as though it were part of the metal.

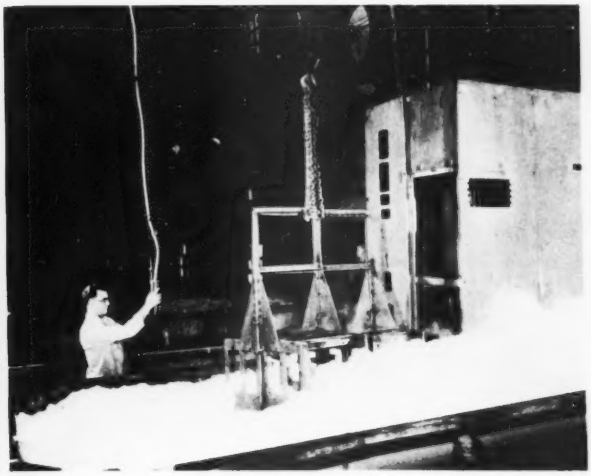
There's no worry about corrosion on the hard-to-get-at undersurfaces of Westinghouse Outdoor Switchgear. After assembly, we spray on a heavy layer of rubberized coating.

Westinghouse Switchgear was born in the famous High Power Laboratory. Working tests in the Laboratory duplicate actual operating conditions. You're sure Westinghouse Switchgear will perform as expected.

Our Booklet B-5306 tells more about the "extras" in Westinghouse Switchgear. Write for your copy. And better still, if you're near Pittsburgh, let us take you through the East Pittsburgh works. We would like to show you how we build equipment that is the soundest investment for your switchgear dollar. J-60820



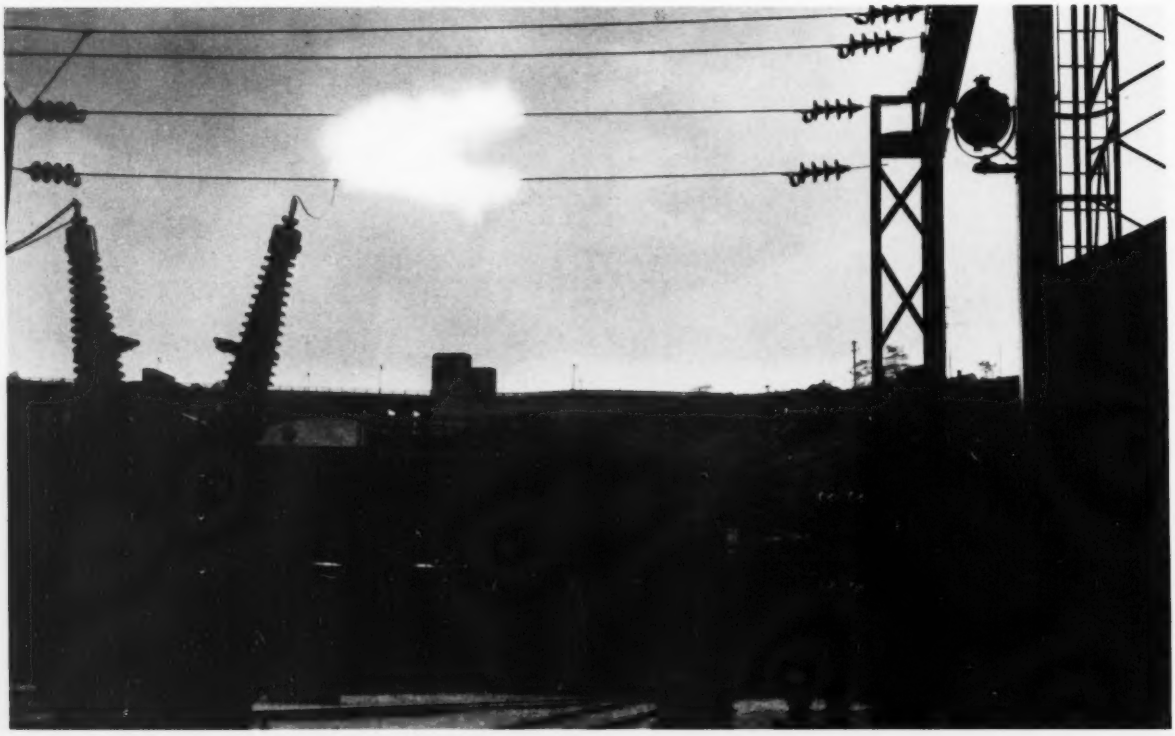
Hard-to-get-at undersurfaces of outdoor switchgear are coated with a corrosion-stopping compound.



To prevent corrosion, the entire metal enclosure gets a five-dip Bonderizing treatment and two coats of paint.

Westinghouse

"Here's how the High Power Laboratory helped make modern breakers possible."



Before Westinghouse built the High Power Laboratory, testing was done the hard way. Early field test setups showed the real need for an all-weather testing location with 24-hour availability. In 1925, forward-thinking management approved construction of . . .

A Laboratory where arcs and short-circuit kva are the standard ingredients . . . poured into test equipment day after day, under controlled conditions. The result . . . outstanding contributions to breaker development such as . . .

The Multi-Flow Grid—which cut breaker times from eight to three cycles and permitted up to 50% reduction in tank sizes. Thanks to continuous tests, Westinghouse has been able to increase Multi-Flow Grid ratings to 25,000 mva at 330 kv. Another landmark in breaker design is . . . the "Watchcase" tank—which reduces oil requirements an additional 50%.

The cumulative experience and test data of the High Power Laboratory are tremendous . . . they will have everlasting influence on switchgear design.

For more details on the Laboratory, "Big Ben" or other subjects discussed on the preceding pages—call your Westinghouse Representative. Or—write direct to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. CP-1003

YOU CAN BE **SURE**...IF IT'S

Westinghouse

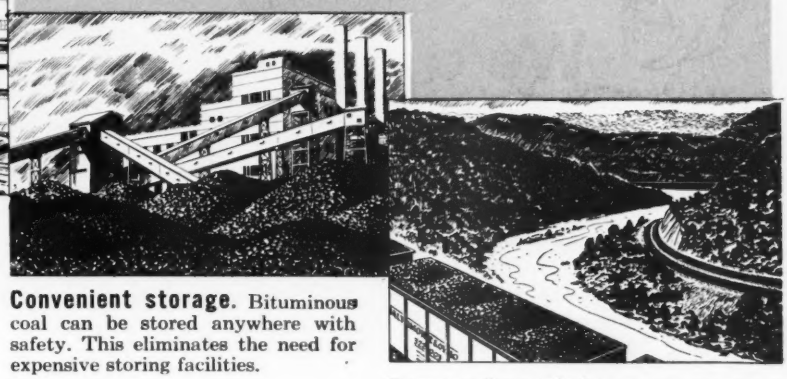
Are you keeping FUEL COSTS as low as you can?

ASK OUR MAN!

He will demonstrate with *facts* why your best bet is bituminous coal. He will help you find the right kind and size of coal for your specific need; and he will show you up-to-the-minute ways of burning it efficiently and economically.

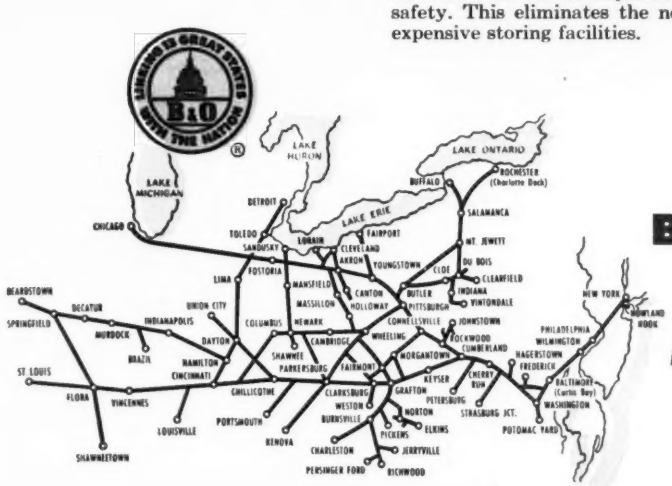
In Baltimore & Ohio territory, close to industry's doorstep, are bituminous coals in all varieties—for power, coking, steam, heating. Produced in highly mechanized mines, these coals are low in cost and uniform in size and quality. With the modern burning equipment now available, the efficiency and cleanliness of bituminous coal will amaze you!

Surprising economy. Conveniently accessible and highly efficient in modern use, bituminous coal from mines on the B&O keeps fuel costs low.



Convenient storage. Bituminous coal can be stored anywhere with safety. This eliminates the need for expensive storing facilities.

Reserves for centuries. Plants built for bituminous coal are assured a continuity of fuel supply regardless of emergencies. On the B&O alone, are reserves estimated at 25 billion tons!



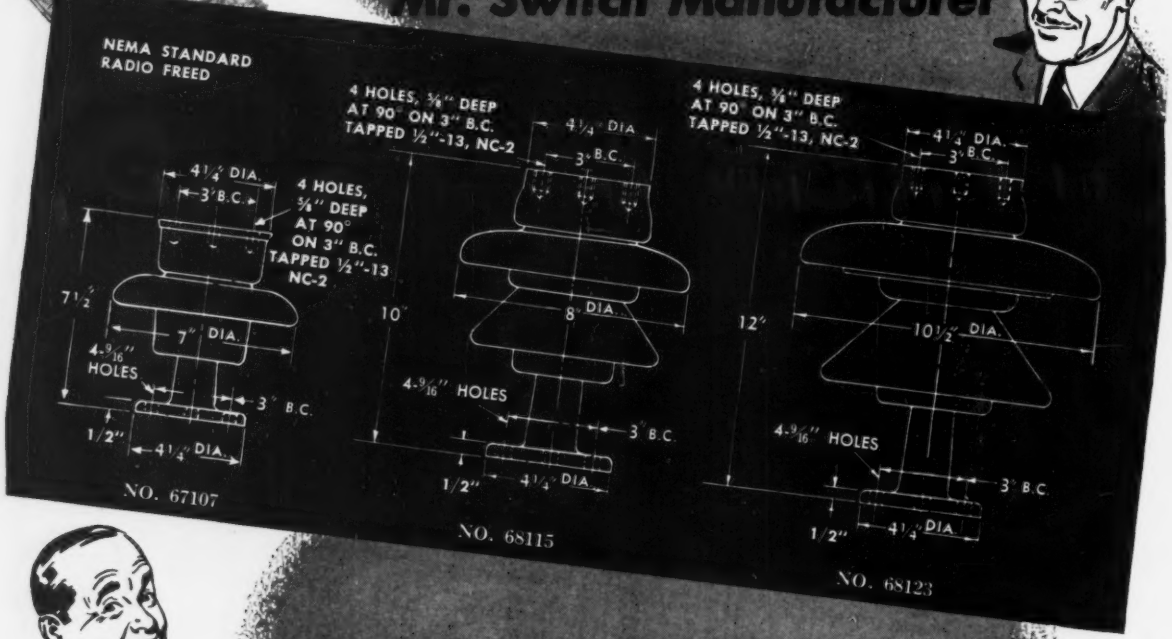
Baltimore & Ohio Railroad

Bituminous Coals for Every Purpose

P. P. INC. No. 69134 STACKS
ON 115 KV SERVICE

Mr. Station Designer

Mr. Switch Manufacturer



We'd Go Out of Business

if we depended on your replacing these rugged insulators!

Because—we build your Switch and Bus Insulators to last forever. We don't expect replacement business but look for your new business.

Finest Wet-process Porcelain—quality controlled, standard designs, expertly assembled, assure long life.

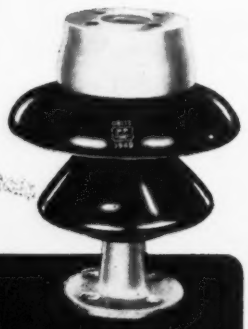
Dimensionally Standard Hardware Components—assure interchangeability—double hot-dip galvanized means low maintenance cost for you—precision jig assembled saves mounting time.

Rugged Designs—to give ample factors of safety over standard characteristics.

Exhaustive Routine Tests—Each shell and every insulator is tested in excess of AIEE-NEMA standards—your safety assured.

Availability—most sizes currently in stock.

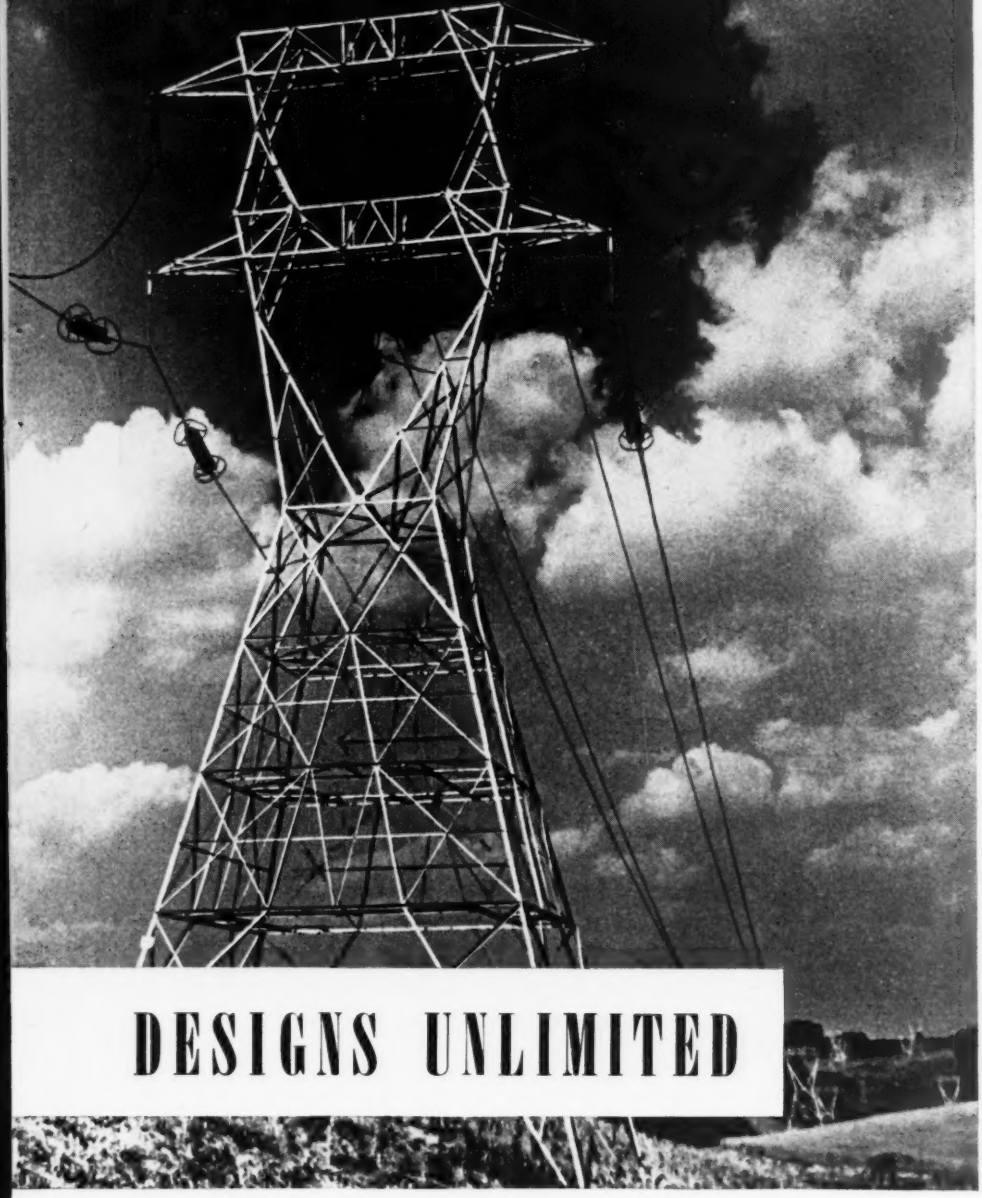
PP INC.

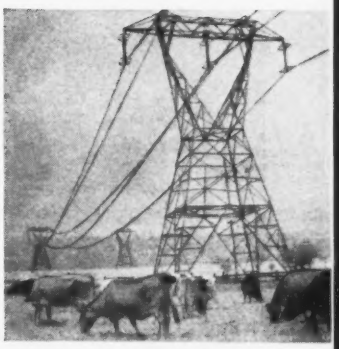


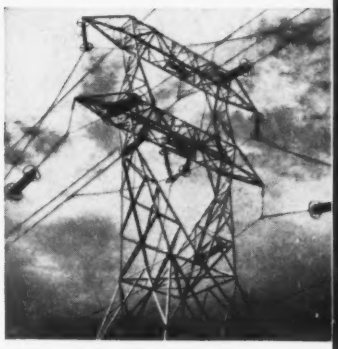
YOUR INDEPENDENT INSULATOR MANUFACTURER

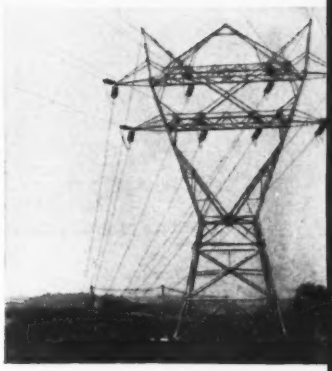
Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA









DESIGNS UNLIMITED

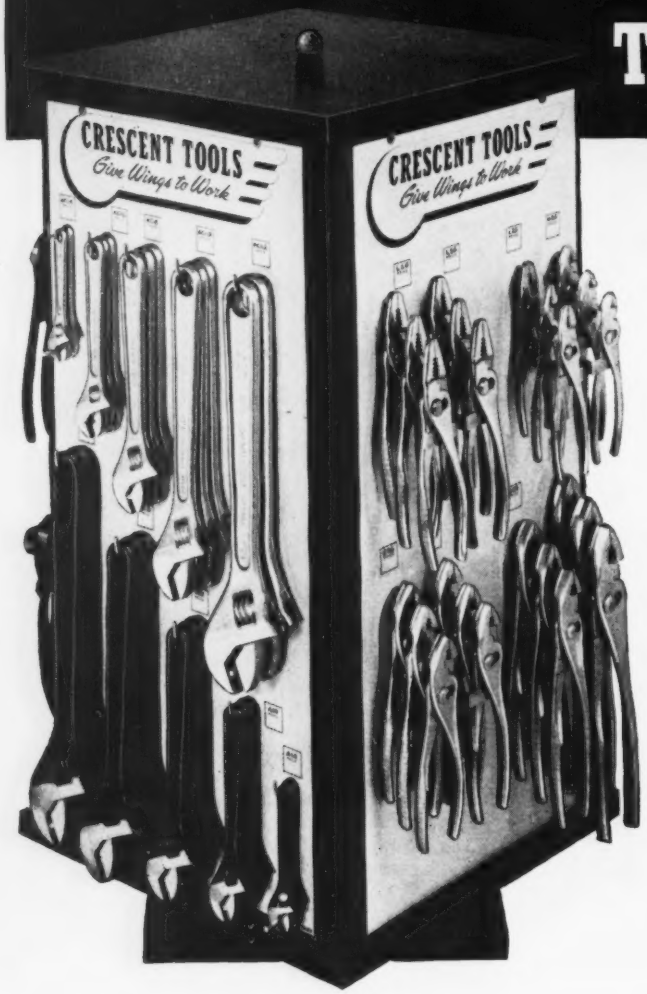
If your engineers have their own ideas on tower design, well and good. We will follow them to the letter and adhere closely to specifications. Your engineers realize, as we do, that despite general similarity no two towers are alike. Each tower must be designed for its particular location and purpose.

Let us apply our four decades of experience in building towers for any and all conditions of terrain and load to your power transmission problems.

BLAW-KNOX

BLAW-KNOX COMPANY
BLAW-KNOX EQUIPMENT DIVISION
PITTSBURGH 22,
PENNSYLVANIA

FOR BETTER TOOLS LOOK FOR THIS CRESCENT REVOLVING TOOL DISPLAY



Crescent hand tools are world famous for their excellent design, fine workmanship and superior construction from materials best suited to the type of work for which the tool is intended.

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WRENCHES • PLIERS • PUNCHES
SCREWDRIVERS • HACKSAWS
TIN SNIPS • CHISELS • NAIL
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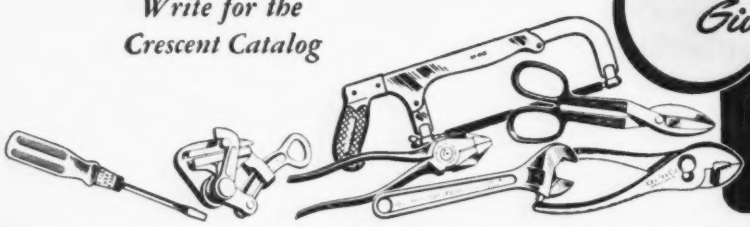
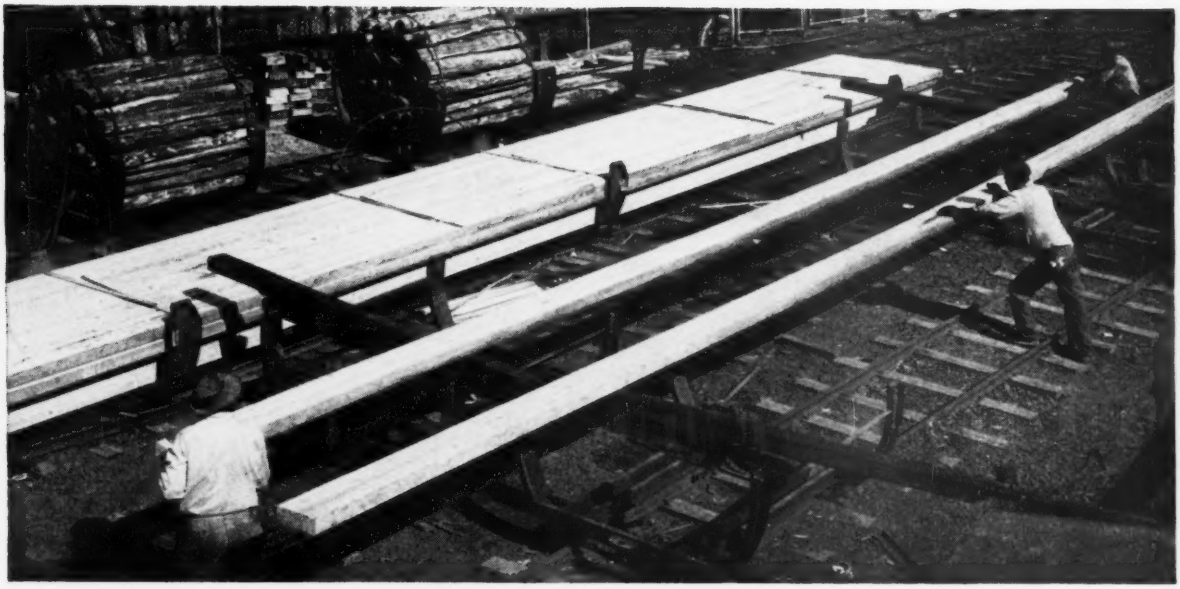


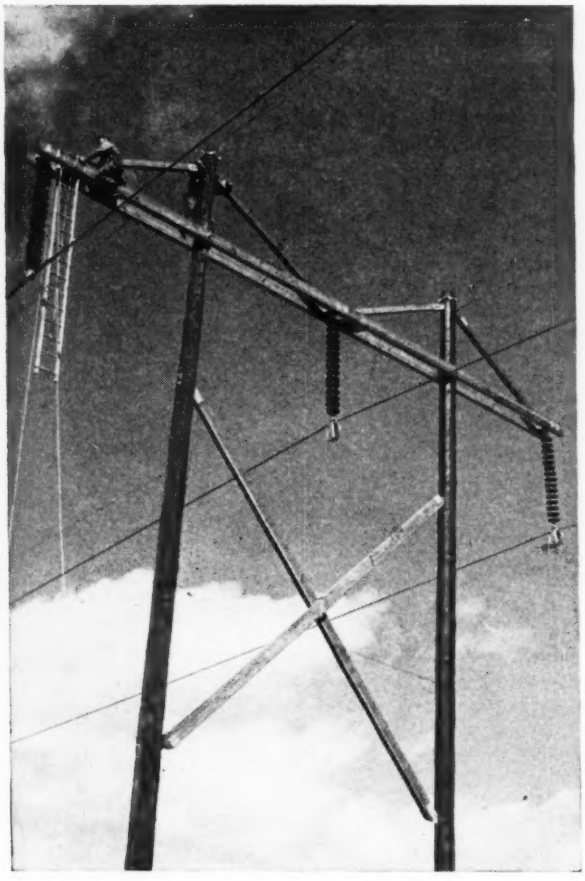
CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by
CRESCENT TOOL COMPANY, JAMESTOWN NEW YORK



Poles and Crossarms on 136-Mile Line

PRESERVED WITH PENTA



To conserve steel and speed into operation the 938,000-kw Joppa, Illinois, generating plant being built by Electric Energy, Inc., for the AEC, wood-pole structures were used on 95% of the transmission line. All the poles were treated with penta to give them longer life, as were the huge laminated wooden crossarms, 46 to 64 feet long.

Three utilities* pooled resources to build this 136-mile, 230-kv line. It will link the systems of the companies and tie them into the new AEC Kentucky Area Project.

Monsanto Penta treatment can cut your wood replacement costs substantially. The preservative is forced deep into the wood, prevents decay, discourages completely termites and other wood-boring insects. More and more utilities are specifying penta. Penta is clean and surprisingly low in cost.

For technical information, and for the names of treating plants near you, call the nearest Monsanto office, or write us. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.

**Union Electric Company, Central Illinois Public Service Company, Illinois Power Company.*

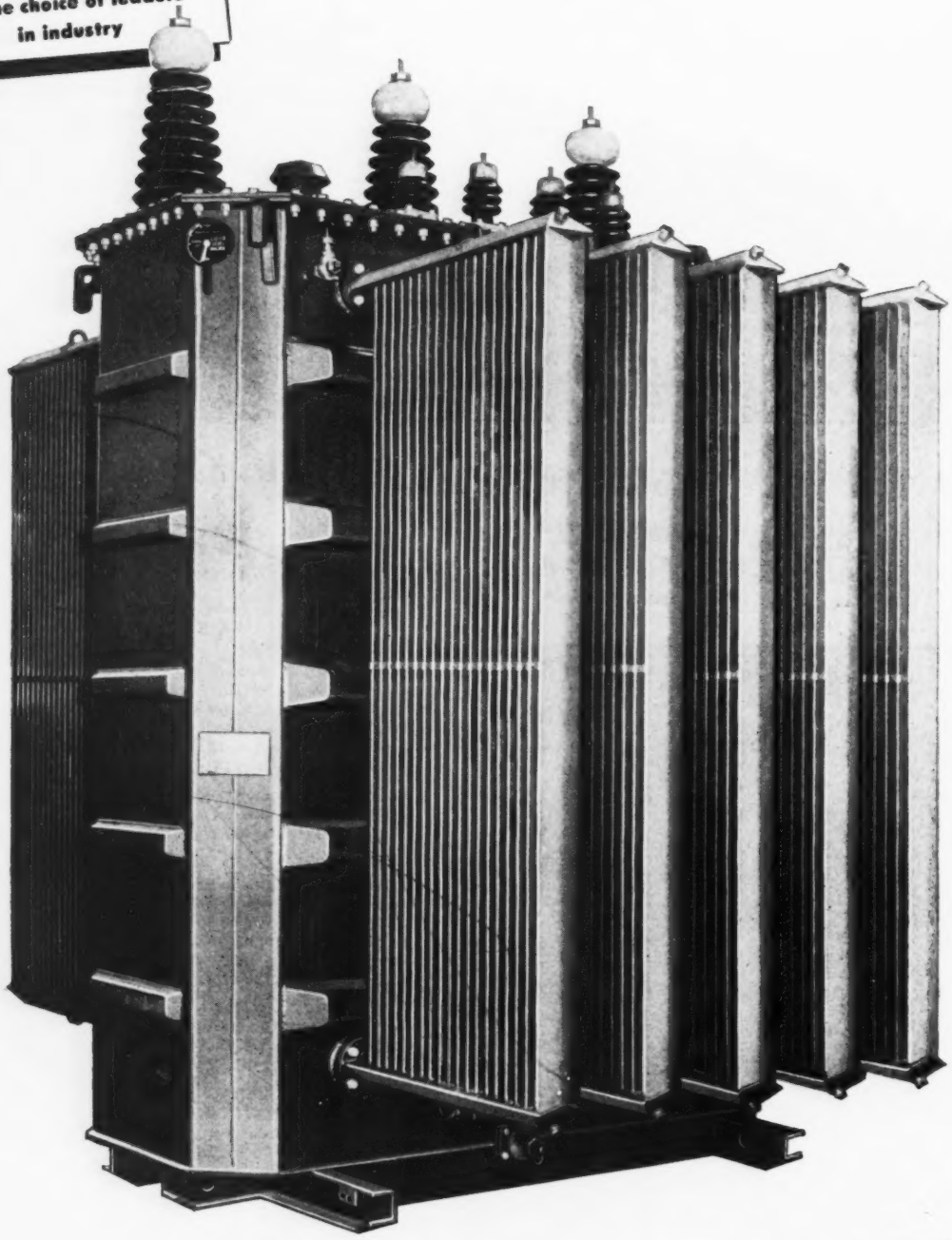
PENTA

MONSANTO
CHEMICALS – PLASTICS

Serving Industry...Which Serves Mankind

SEND for this 16-page illustrated booklet "Specify Penta." No obligation. Write Monsanto (address above) for your copy.

Wagner
TRANSFORMERS
...the choice of leaders in industry



Wagner
Electric Corporation
EST. 1891

T53-3

Wagner Power Transformers Meet ASA C57.12a Standards

give you Wagner quality and dependability at reduced cost

When you need power transformers, why not check ASA C57.12a Standards and use them as your specifications on all your requirements for 10,000 kva and below—three phase... and 5,000 kva and below —single phase ratings. In addition to saving the cost of preparing your specifications, you will also realize a substantial saving in price by using Wagner Standard Transformers.

Wagner Power Transformers have been serving the power industry dependably for over sixty years. Service records from the field, dating back to the early days, prove their ability to give continuous service over unusually long periods of time. They are compact in design and are built with painstaking care to give them inherent strength and stability. They have sufficient capacity not only to carry their normal load, but to be able to handle overloads—again and again—whenever emergencies arise.

Why not consider Wagner Standard Power Transformers for your next installation? Get full information from your nearby Wagner engineer (there are Wagner branch offices in 32 principal cities)—or write us.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Avenue • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

Better load records . . . lower cost! Safer and easier, too. No need to climb for ammeter checks. No guessing about overloads. Dial can be read from the ground.

New overload indicator takes *guess* and *work* out of load surveys

It flashes a warning . . . *and counts overloads, too!*

The new Westinghouse Type "PL" Overload Indicator eliminates load-check climbing, puts an end to guesswork about overloads, and does it more accurately than any comparable device.

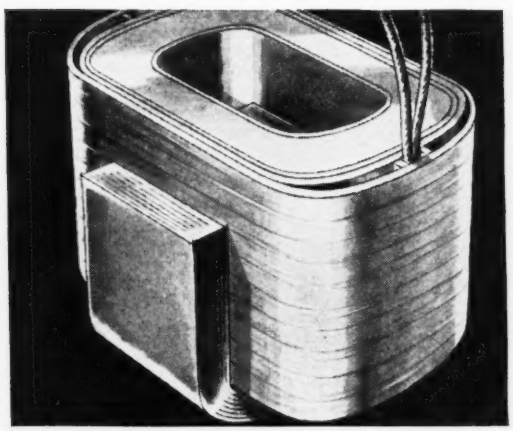
The red light tells that the transformer is now or has been overloaded. The dial completes the story, telling *how many times.* Since the indicator is operated by a thermostat embedded in the coil, indication is highly accurate because it is a direct reaction to copper temperature.

On each of the first four overloads, whether they're hours, days or months apart, the warning signal lights. It then goes out automatically as the overload passes, but the dial shows the number experienced. On the fifth overload, the signal light locks on as a continuous warning of the serious condition. The dial records consecutive overloads up to 28 . . . far more than should occur before change-out. A push-button is provided at the base of the dial to clear the indicator for a new load-checking cycle.

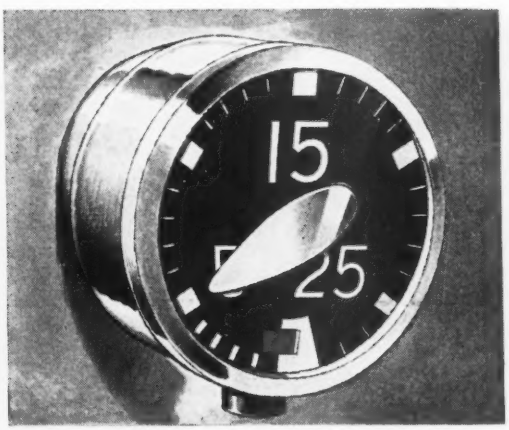
Developed as the result of years of co-operation with utilities to determine the most useful type of overload indication, the Westinghouse Type "PL" Indicator opens the way to more accurate load records than ever before possible . . . at a fraction of the time and expense. Available on all conventional models of Westinghouse Single-Phase Distribution Transformers, 3 through 167 kva, 15,000 volts and below. Your Westinghouse representative will be glad to give you further information, or write direct to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70669

YOU CAN BE **SURE**...IF IT'S

Westinghouse



Highest possible accuracy! The new Westinghouse Type "PL" Overload Indicator is operated by a thermostat which is embedded in the transformer coil, where it reacts directly to copper temperature.



Warning . . . overworked transformer! The red light shows overload condition; the pointer indicates how many times this has happened. Reset button at base of dial may be used to return the pointer to zero.

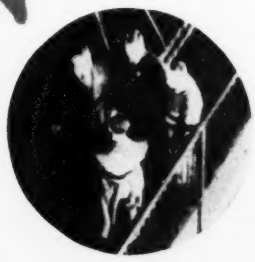
HE'S YOUR MAN!

. . . and he READS Electrical World, the best read publication, *by far*, in the great electric power industry!

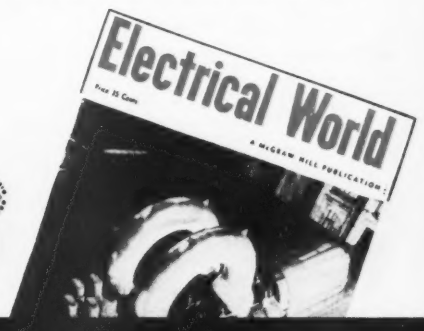
No question about it, he's the man you've got to sell, regardless of whether he's a power engineer for a utility company, a consulting electrical engineer, or an electrical engineer working for a large industrial plant. And you can be equally certain that you'll reach your man if you tell him your story in the advertising pages of Electrical World . . . the magazine which electrical men turn to *more than any other* for information to help them do their jobs and do them better.

PROOF? Here are just a few of the reasons why Electrical World is able to deliver more high powered readership than any other magazine in its field:

- Electrical World publishes nearly three times as much vital editorial material, week in and week out, as the next largest magazine. And with quantity, World readers get quality, too . . . quality that is evidenced by the overwhelming preponderance of Electrical World mentions in electrical engineering bibliographies.
- Electrical World has one of the largest editorial staffs in industrial journalism . . . four times that of any other publication in the industry.
- Electrical World's circulation is carefully screened *paid* circulation . . . the best guarantee of the responsiveness of a publication to the needs of its readers.
- Electrical World has *never* failed to score an impressive margin over any of its competitors in readership surveys conducted independently by manufacturers over their own lists of customers and prospects! In fact, Electrical World has a standing offer to pay for any readership study made by an electrical manufacturer, provided the results are made available to Electrical World (two studies have just been completed, why not ask to see them?)



REMEMBER – when you buy advertising space, you're paying for only one thing–readership . . . and Electrical World delivers more bona fide readership than any other business publication in the field. Want to reach "Your Man"? You can do it – and do it best – in Electrical World, for 79 years the basic reference of the electric power industry.



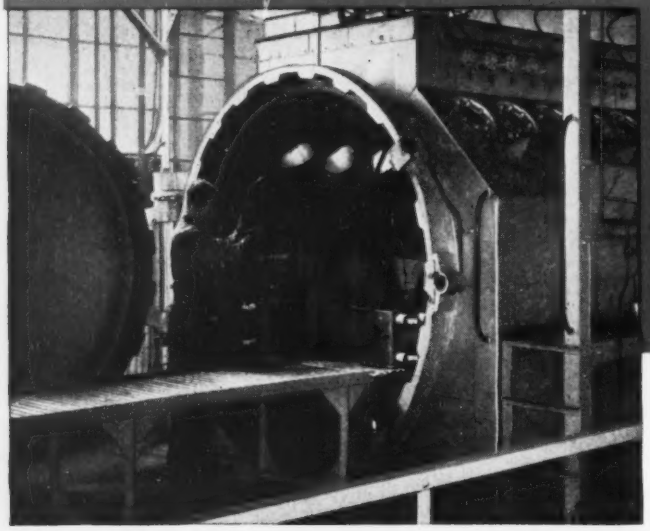
Electrical World

Where the electric power industry gets the most information . . . and gets it first.

A Weekly McGraw-Hill Publication, 330 West 42nd Street, New York 36, New York

Get all 4 advantages

ALLIS-CHALMERS INSTRUMENT TRANSFORMERS



1. *Insulation completely protected against air and moisture*
2. *No insulating liquids to maintain*
3. *No leakage — simplified storage and handling*
4. *High dielectric strength*

VACUUM-PRESSURE PROCESS ADDS YEARS TO INSTRUMENT TRANSFORMER LIFE. In the chamber shown above, Allis-Chalmers vacuum-pressure compound-filling process makes the core and coil assembly and its insulation a solid, compact unit within its case. As a result, insulation is completely protected against outside air and moisture. High dielectric strength is assured. And transformer maintenance is greatly reduced.

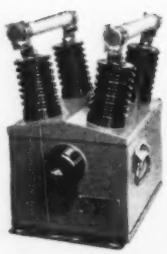
HERE'S HOW IT'S DONE

Two steps do the job. First, a combination of high vacuum and heat drive moisture from the core and coil assembly. Then, while the vacuum is maintained, the case is filled with hot compound which is chemically stable and free of absorbed gases and impurities. This draws hot compound into the innermost parts of the assembly, preventing local ionization and extending normal insulation life.

ELIMINATES PERIODIC TESTING

Since compound-filling eliminates insulating liquids, periodic inspections can be reduced. There is no need for filtering or testing liquids. Storage and handling are simplified because there is nothing to leak out. It is easy to see why you save money and trouble. Why not call your nearby A-C district office today and get more information. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Outdoor current transformers, Type KO, rated up to 15 kv and 1800 amp.



Indoor potential transformers, Type PD, rated up to 14,400 volts, 200 va, fused or unfused.

Outdoor potential transformers, Type PWD, rated up to 15 kv, 200 va.

A-3978

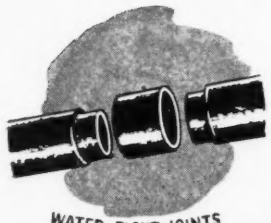
ALLIS-CHALMERS

1893 — 60th Anniversary — 1953

EASY TO INSTALL

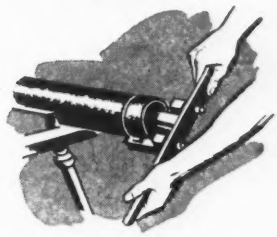
LIGHT - EASY TO HANDLE

CUTS WITH SAW

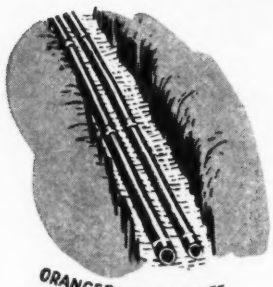


WATER TIGHT JOINTS

5°36'R BEND SECTIONS TO MEET SPECIAL RADIUS APPLICATIONS IN THE FIELD



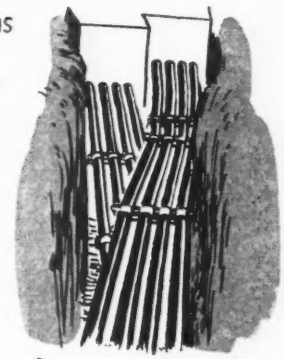
EASY TO TOOL



ORANGEBURG NOCRETE

NEW BASE SPACER

COMPLETE LINE OF INTERLOCKING PLASTIC SPACERS



ORANGEBURG STANDARD

Installations Made Easy . . . With Complete Cable Protection At Minimum Cost!

Orangeburg Fibre Conduit lays faster and at lower cost than any other type of conduit. Its light weight speeds handling. It is easily sawed and worked in the field. Just a few taps set up a permanently tight joint. Orangeburg's Bend Sections and complete line of fittings help you to make still further economies. And once installed Orangeburg provides complete and permanent protection for the underground cables that supply so many electrical services.

These advantages have created an acceptance that keeps Orangeburg a leader in every city and state.

Orangeburg Conduit is clearly identified by its registered trademark. Make sure it's on the conduit *you* install. For illustrated folder of Orangeburg Bend Sections and Angle Couplings, write Dept. EW-43, Orangeburg Manufacturing Co., Inc., Orangeburg, New York.

ORANGEBURG®
FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

GraybaR ELECTRIC COMPANY

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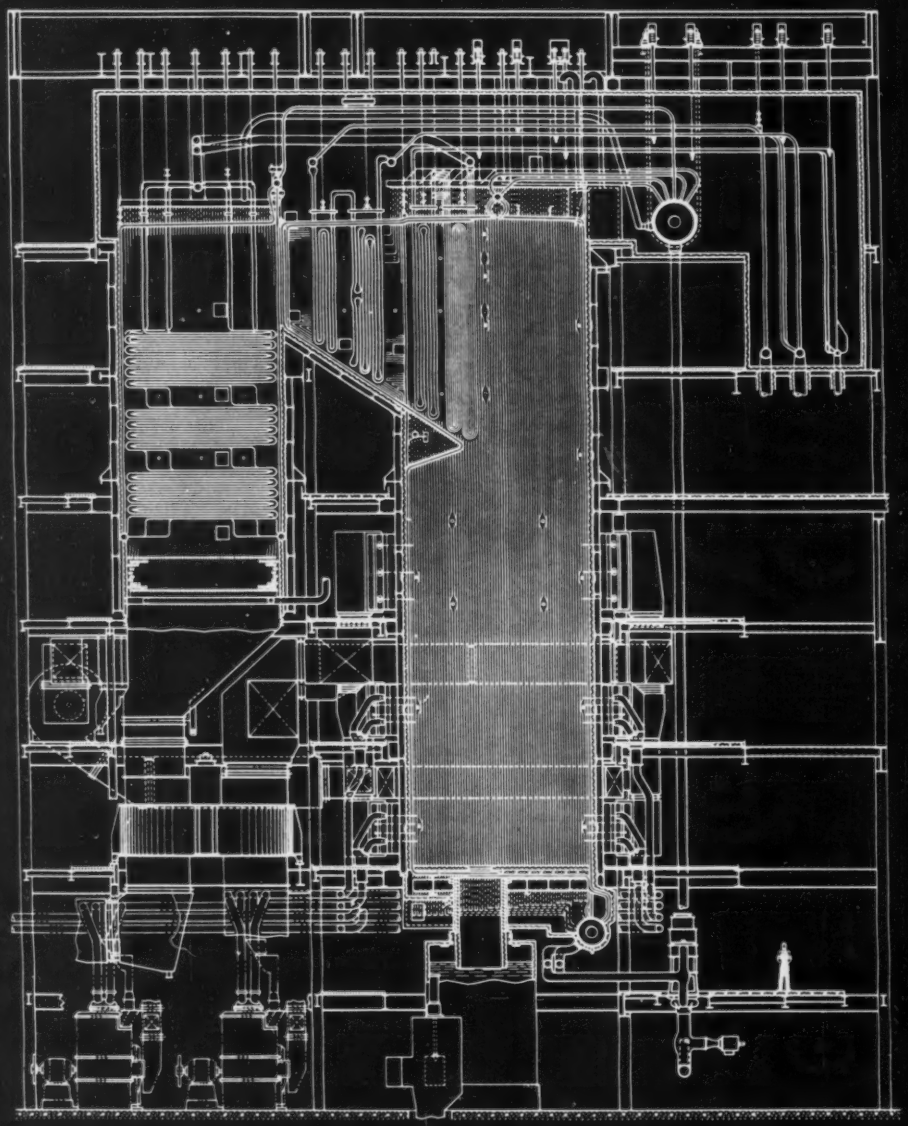
BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

KEARNY.....



C-E CONTROLLED CIRCULATION REHEAT BOILER

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

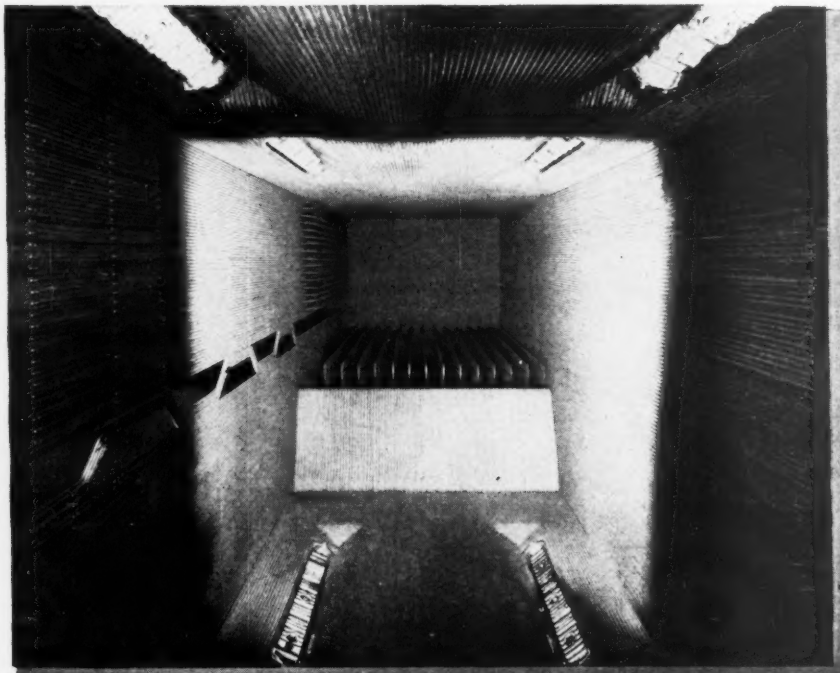
... starts up WORLD'S FIRST 1100 F, 2650 psi BOILER

March was a significant month for both Public Service Electric & Gas Company and Combustion Engineering. It was "starting up" time for preliminary trial runs of the equipment comprising the new extension of P.S.E.&G's Kearny Generating Station at Kearny, N. J.

But this was not just another "starting up" of a large utility installation. It was something special for all concerned because it brought to Kearny the distinction of being the first power station in the world to use a steam temperature as high as 1100 F and a turbine throttle pressure of 2350 psi.

The Kearny boiler is also notable as one of the first controlled circulation boilers of the modern reheat type to go into service. Designed for a pressure of 2650 psi, it has been hydrostatically tested to 4000 psi. It will supply steam to a 145,000-kw turbine-generator at a primary temperature of 1100 F, reheated to 1050 F. A duplicate installation is scheduled for service this summer.

Combustion Engineering is proud to be associated with the advancements in steam-power practice which the Public Service Electric & Gas Company has achieved at Kearny.



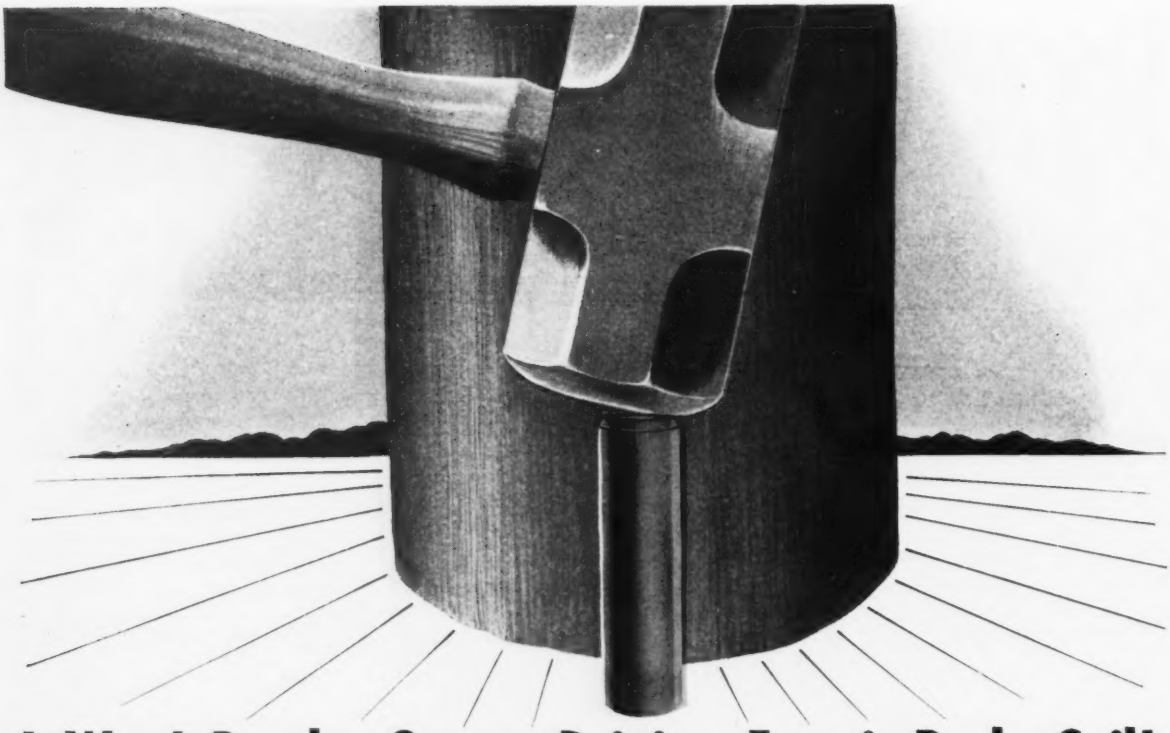
View looking upward from bottom of furnace showing tilting tangential burners, center wall at left and platen type superheater in middle area.

B-664

— SUPERHEATER, INC.
200 MADISON AVENUE, NEW YORK 16, N. Y.

C-E

GEORGIA POWER COMPANY...



It Won't Bend or Scar on Driving, Even in Rocky Soil!

Permanent, Efficient Grounding from a Dependable Mid-West Source

- ★ Extra-rigid steel core — will not bend on driving.
- ★ Completely covered, including both ends, with heavy copper sheath, molecularly bonded to core to give you permanent grounding.
- ★ Rolled finish produces hard scar-resistant surface for driving in rocky soil.
- ★ Produced in the Mid-West for quick delivery to all parts of the U. S.

Stocked by Leading Wholesalers

BLACKBURN
Copper-Bonded
GROUND ROD

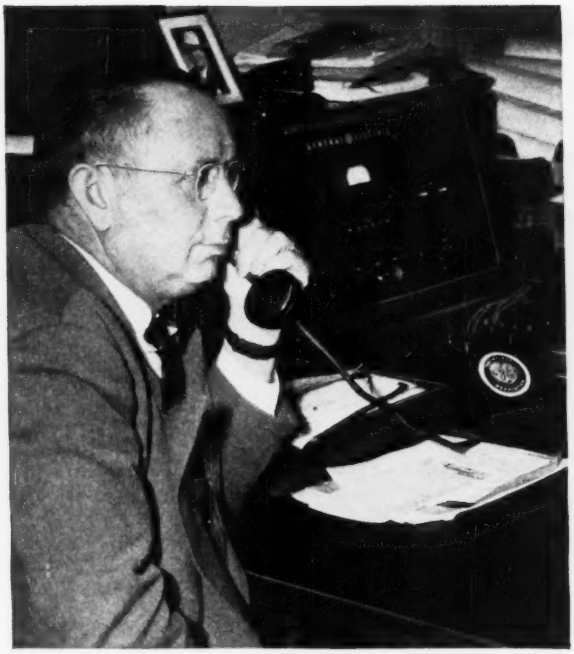
Note uniform copper covering, molecularly bonded to steel core.

Distributed on the West Coast by KORTICK Manufacturing Co.

JASPER BLACKBURN CORPORATION
35 Madison St. • St. Louis 6, Mo. • Phone CEntral 3007

GEORGIA POWER COMPANY...

"Electric service expansion?
G-E Mobile Radio
is our reserve work crew!"



● F. A. "Doc" Nabors, dispatcher at the Macon base station reports emergency crews do 100% better work with 2-way radio.

● All trouble crews in the Georgia Power Co. districts have radio. R. E. King, above, reports completed work . . . gets new job instructions *immediately!*

WITH a radio system that now includes 38 base stations and 360 mobile units, Georgia Power Company has had wide experience in the use of communications for utility service.

G-E 2-way radio plays a vital role in meeting the demands imposed by Georgia's tremendous industrial expansion. Maintenance, construction and emergency service are all co-ordinated with *instant radio communication.* The result: *efficiency of operations has increased* to enable the Georgia Power Company to meet the growing needs for electric power.

1878 75 1953
YEARS OF ELECTRICAL PROGRESS

CALL THE CAS* MAN at our local General Electric office for complete information on G-E 2-way radio equipment for utility companies.

**Communications Advisory Service*

SEND FOR COMPLETE INFORMATION

General Electric Company, Section 1943-20
Electronics Park, Syracuse, N. Y.

Please send me complete information on G-E 2-way radio equipment for utility companies.

NAME.....

ADDRESS.....

CITY.....STATE.....

GENERAL ELECTRIC

This man just called the right number

A special problem had arisen in this man's business—a problem that his busy staff was unable to handle since it was already working full time on regular day-to-day duties. But this man knew what to do. He called EBASCO.

EBASCO has built its reputation in answering calls from businessmen and assisting them with their problems. For nearly fifty years EBASCO specialists—engineers, constructors, business consultants—have been serving many different companies in many different fields of business and industry. If you have a business problem, EBASCO can help you, too.

How? First, through experience. EBASCO has a world of experience from handling big jobs and little jobs—in full, or in part—throughout the United States and many foreign lands. Second, through specialists. EBASCO's long list of specialized services covers every field of industry and every phase of business. Third, through teamwork. EBASCO consists of many skilled men with outstanding ability who work closely together as integrated teams.

If you have need of this experience, specialization and teamwork, a call to EBASCO can put them to work for you. May we send you a copy of our booklet, "The Inside Story of Outside Help," which describes our many services? Write to: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

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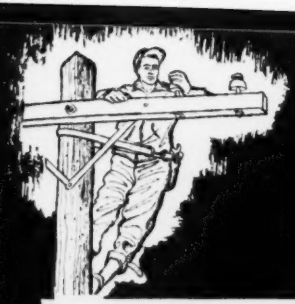
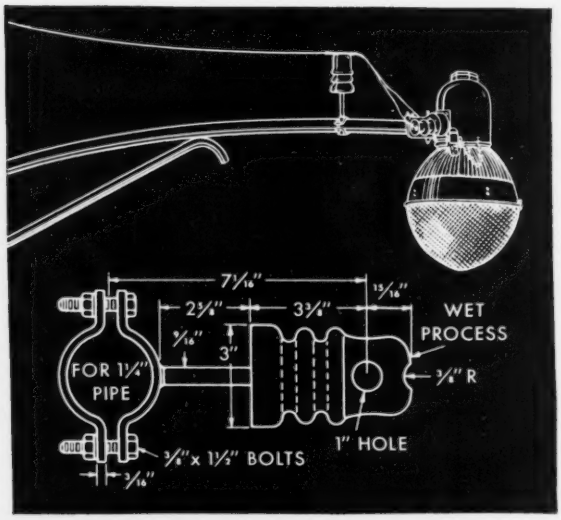
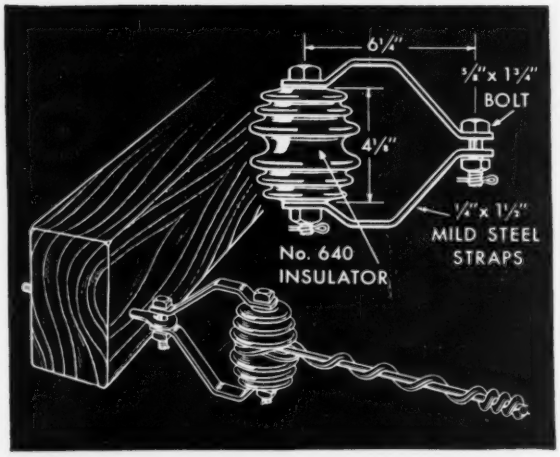
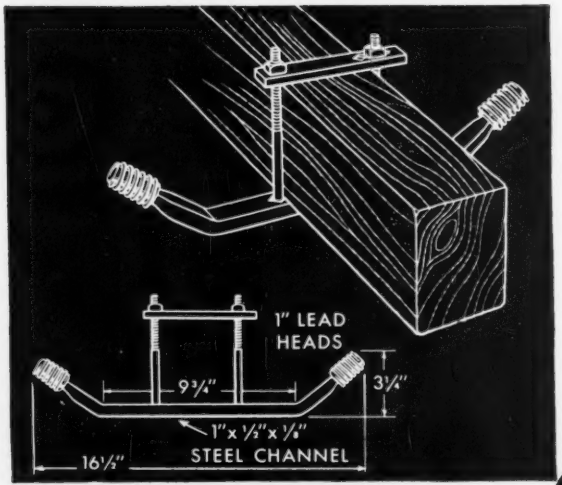


LINE CONSTRUCTION BLUEPRINTS

HOW SOME UTILITIES ARE MAKING CONSTRUCTION WORK EASIER . . .
IN WAYS THAT MAY BE HELPFUL AND USEFUL TO YOU.



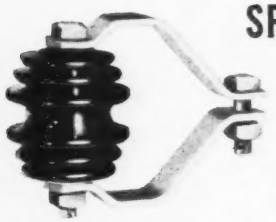




DUPLEX CABLE BRACKET

Cat. No. BA209X3

Installed on a 1¼-inch pipe bracket to provide a rigid insulated support for the luminaire end of high voltage series duplex cable. Simplifies street lighting installations.



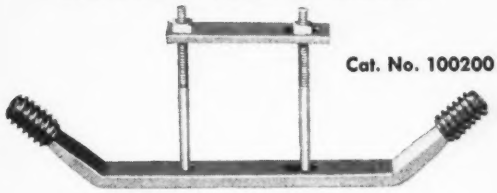
SPLIT DEAD END CLEVIS

with Offset End

Clevis-Cat. No. 1983L
Insulator-Cat. No. 640

Provides a swinging type clevis for dead ends and angles on primary lines up to 4800 volts delta and 2400/4160 volts wye. The cotter pins keep the nuts from turning off of the bolts.

CROSSARM DISTRIBUTION BRACKET



Cat. No. 100200

These brackets carry wires vertically from arm to arm, or horizontally from one end of the arm to the other. Made of heavy steel channel, mounted by two ⅜″ x 6″ machine bolts threaded 3″, and ¼″-thick back strap. For crossarms from 3¼″ x 4¼″ to 4″ x 5″.

Do you have a line construction problem?

These are just a few of thousands of L-M line construction specialties. If you have a line construction problem, let us know. We may have standard or special items in stock that will solve it. Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division). 114

LINE MATERIAL

Line Construction Materials

1. One-piece heavy plated

Interrupting ratings now up to 6000 amperes at 4.8 kv, 4000 amperes at 14.4.

Complete range of nominal load ratings from 25 to 200 amperes, for 2.4 to 14.4 kv service, makes available the greatest number of sectionalizing points in this class.

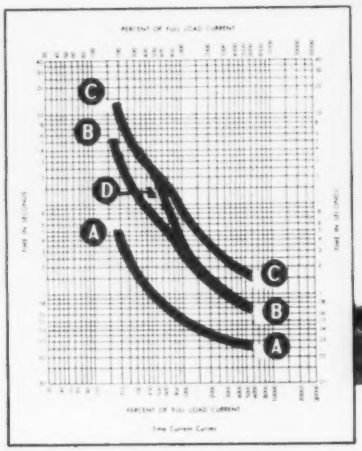
Only Recloser with:

Choice of four time-current curves, ten tripping sequences, which gives maximum flexibility in meeting all coordination problems on heavily loaded distribution circuits.

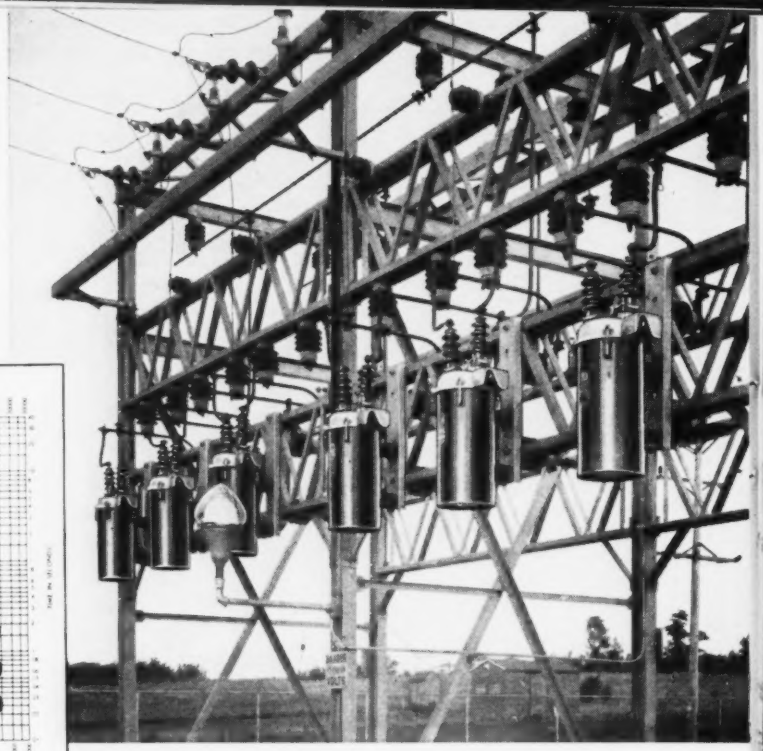
Full power-class design, with 110 kv basic insulation level.

Clamp-on bushings, with plated Universal terminals for copper or aluminum conductor.

Oil Cross Blast arc interruption insures rapid clearing of heavy faults.



Only recloser with choice of 4 time-current curves and 10 operating sequences. Coils and sequences are easily changed in the field.



Kyle Type L Reclosers at a middle-western power company substation, where they help assure uninterrupted service to an urban area.

L-M Increases Interrupting Rating, Adds 200-amp Rating to Kyle Type L Recloser

To protect substations and feeders with heavier loads and higher fault currents, L-M has added a 200-ampere rating to the Kyle Type L Recloser, and has increased interrupting ratings appreciably.

The higher interrupting ratings are based on extensive testing of production reclosers, as well as field experience, and apply to Kyle Type L Reclosers already delivered.

The new higher nominal load rating involves a new coil and some increase in the capacity of certain current carrying parts. The changes can easily be made on any Type L reclosers now in service if desired.

The Kyle Type L not only handles present heavy loads, but it offers increased capacity for the future, plus the present benefits of Type L performance and economy. It provides complete coordination with fuses and other reclosers in series, with a corresponding reduction in fuse blowing and service calls.

Heavy Duty
Type L Single Phase
Nominal Rating 14.4 kv, BIL 110 kv

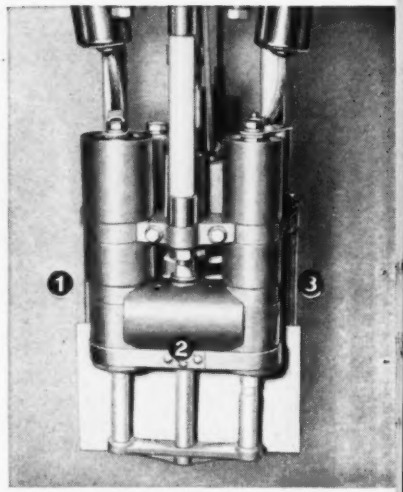
Rating Amperes	Minimum Tripping Current Amperes	Interrupting Ratings* Symmetrical RMS Amperes at Maximum Phase to Phase Nominal Voltage of: 4.8 kv	14.4 kv
25	50	1500	1500
35	70	2100	2100
50	100	3000	3000
70	140	4200	4000
100	200	6000	4000
140	280	6000	4000
200	400	6000	4000

*Recloser interrupting ratings are based on the maximum test circuit X/R ratio of not less than 8, and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

Get the Details

Ask the L-M Field Engineer for full information on the Type L and other Kyle Reclosers providing complete, coordinated protection; or write for a copy of bulletin CR-1A. Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

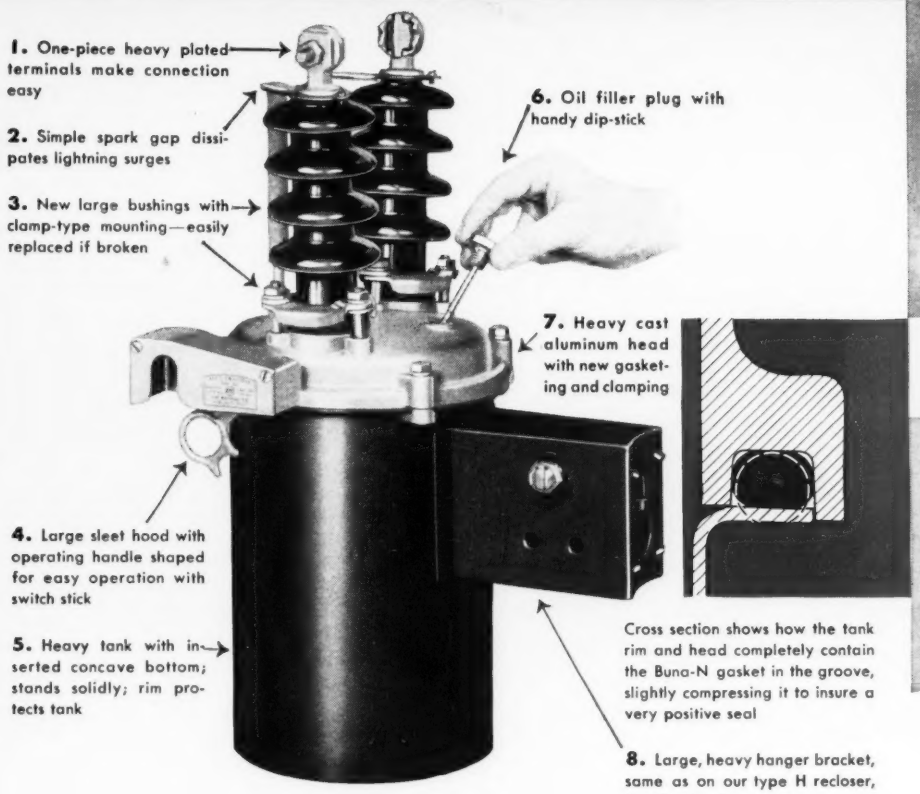
Kyle Reclosers are filled with ORTO®, L-M's oxidation-resistant transformer oil.

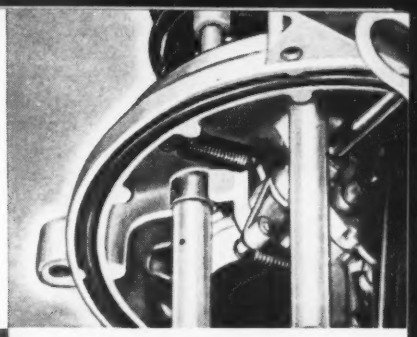


Rapid oil cross blast arc interruption. Double contacts draw two arcs in series. Gas from one arc at 1 blasts oil in chamber, 2, across arc at 3, extinguishing it.

LINE MATERIAL
Kyle® Reclosers

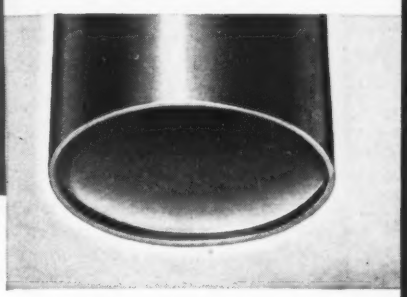
COMPLETE COORDINATED AUTOMATIC PROTECTION FROM SUBSTATION TO LOAD


1. One-piece heavy plated terminals make connection easy
2. Simple spark gap dissipates lightning surges
3. New large bushings with clamp-type mounting—easily replaced if broken
4. Large sleet hood with operating handle shaped for easy operation with switch stick
5. Heavy tank with inserted concave bottom; stands solidly; rim protects tank
6. Oil filler plug with handy dip-stick
7. Heavy cast aluminum head with new gasketing and clamping
8. Large, heavy hanger bracket, same as on our type H recloser, for direct pole mounting



Underside of head shows groove for gasket with lugs to retain gasket when head and mechanism are raised.

Cross section shows how the tank rim and head completely contain the Buna-N gasket in the groove, slightly compressing it to insure a very positive seal



Bottom view of tank showing inserted bottom and heavy edge that assures stability on the ground and protects tank bottom against scratches.

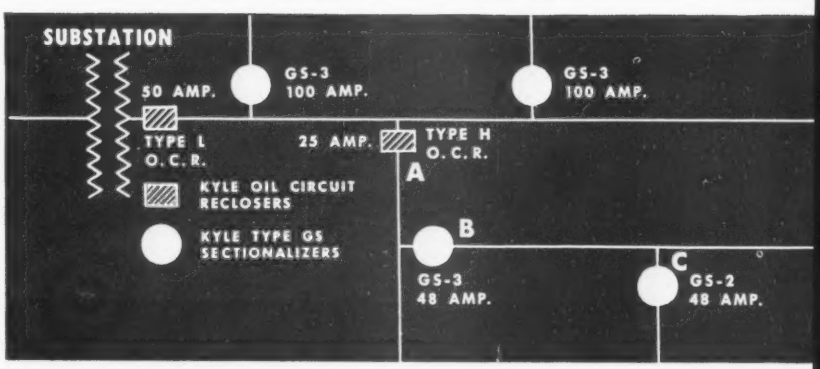
L-M's $47 Kyle® Type GS Sectionalizer Completes Your Automatic Protection

The Kyle Type GS Sectionalizer provides a means of automatically isolating faults on branch lines of a distribution system on which automatic reclosers are used.

Recent improvements illustrated above make the Sectionalizer more convenient to install and operate.

The Kyle Sectionalizer does not interrupt fault currents, but is set to open on a permanent fault, during the time that the recloser is open. It may be set to operate after the first, second, or third operation of the recloser, thus isolating the branch and permitting the recloser to reclose. Thus service is maintained on all but the branch with the fault.

By completing the chain of automatic protection, the Sectionalizer reduces service calls and eliminates fuse replacement; it eliminates the possibility of upsetting coordination by installing the wrong fuse; it provides greater safety when used as a disconnect, and when the line is re-energized after a fault has been corrected. And the low $47 price makes it an outstanding value.



Completely Automatic from Substation to Branch

In the diagram, A is the recloser. B is a Kyle Sectionalizer set to open during the *third* operation of the recloser (indicated by GS-3). C is set to open after the *second* operation of the recloser. If a fault occurs beyond C, recloser A operates. If the fault doesn't clear on the first operation, the recloser opens again, and Sectionalizer C opens, isolating the tap. Then the recloser re-energizes the rest of the branch.

If a fault occurs *between* B and C, Sectionalizer C does not operate. But if the fault has not cleared by the third operation of the recloser, Sectionalizer B opens, isolating that branch. The recloser then re-energizes the rest of the line.

Other branches are also protected by Kyle Sectionalizers which are opened by the 50-amp type L recloser at the substation.

Get This New Bulletin

"Use of Kyle Sectionalizers on Distribution Lines" is a brief, clear presentation of the application and operation of Kyle Sectionalizers. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Div.).

112

LINE MATERIAL
Kyle® Sectionalizers

Harvey Prine gets ready to crate the 100,000th Kyle Type H Recloser as it comes off the production line. This recloser will be displayed at various L-M and industry meetings.

Alice Flancher, Inspector, is testing springs. "We give every spring an over-tension and under-tension test. One of our suppliers didn't see how we could be so accurate, till he saw the testing machines we designed ourselves. Now he's building one like it. These springs are important to the recloser's operation. I'd sure hear about it if I let a bad spring slip past."

100,000th Kyle® Type H Recloser Comes Off The Production Line

"I guess we at Kyle ought to know something about reclosers. We've made so many of them."

by **OSCAR HANDBERG,**
Foreman,
Assembly Department,
Kyle Products Plant,
Line Material Company

I'd like to tell you why you get so much more value in a Kyle Recloser. That value consists of a lot of big and little things.

First, our engineers have more recloser experience. More experience working in the laboratory, and working with you, on your lines.

Second, there's the company's reputation. We're pretty conservative on ratings, on design. Just "commercially acceptable" doesn't go around here. Every piece of our apparatus has to be *right.*

Third, and most important, is the spirit and pride of the men and women who make Kyle Reclosers. You'd be surprised at how much interest there is, all along the line. Most of our people have a pretty good idea of what a Kyle Recloser does, and what can happen if it should fail. So we have very, very few failures.

Our people want their jobs to pass the plant inspections, sure. But they also want our reclosers to pass the real tests—the tests of shipping and handling, and of bad weather and long years of service.

I guess we at Kyle know something about reclosers. We've made more than a hundred thousand of the Type H alone. That's in addition to the other models, and Sectionalizers and Oil Switches.

We know that you, the customer, are the real boss here. And we feel you appreciate the care and the pride of workmanship that goes into every Kyle Recloser.

Kyle Reclosers provide complete, coordinated automatic protection, from substation to load. Kyle Reclosers have many convenience and safety features. There is a full line of single- and 3-phase Kyle Reclosers, for pole and substation mounting, up to 100,000 kva and 6000 amperes interrupting rating.

For full information about Kyle Reclosers, ask the L-M Field Engineer. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Bob Bocock, Coil Winder: "I've been winding coils for a long time. You've got to be sure to have the right number of turns on every layer, and the right number of layers. If I didn't do that, the rating would be off, and Jimmy Hall would rib me for weeks. If we nick the insulation or find a bum spot in it, we just toss it out and start over. No use taking chances on a swell piece of apparatus like this!"

Ed Steele, Final Assembler: "Oscar Handberg, my boss, tells me I've assembled more than 85,000 reclosers. I'm proud of them, too. We are all inspectors as the job progresses. Everyone has gotten into the habit of giving a visual inspection to parts as we use them—that cuts rejects to practically nothing, and we know utility men can sleep nights because Kyle Reclosers are on the job."

George Humsic, Grinder: "I'm grinding trip pistons on this centerless grinder. They fit into the hydraulic frames Lloyd Willms is boring. They've got to have a good finish. If they're rough, they might stick and the recloser might not operate as it should. That could be bad. This is a pretty nice machine. We can hold to two ten-thousandths of an inch tolerance. The pistons will get two more checks along the line. So we know they'll fit."

Lloyd Willms, Lathe Operator: "I've just bored and reamed this frame. This Sheffield air gauge checks tolerances down to less than a ten-thousandth. If one of these bores is a little undersize, George's pistons won't fit. If it's oversize, the recloser won't work right —and Jimmy Hall would catch it on final test. But with all the checking we do, there's very little chance of a bad part ever reaching final assembly."

Harold Murphy, Assembler: "This is the hydraulic frame Lloyd just bored, and I assemble it with the piston George has been grinding. One thing that helps is the way we rack these parts to protect them during handling. This mechanism is simple but we sure are careful about dimensions. If we weren't, some day the wrong recloser might lock out when it wasn't necessary. You just don't get careless on *this* job!"

Jim Hall, Tester: "I guess I am the final word—after Ed has put the recloser together in final assembly, it comes to me and I test it for calibration. The timing of the Kyle Recloser is in the hydraulic system, so after I have made sure of this calibration there is really nothing that can happen to it to change its timing. Believe it or not, in 100,000 reclosers, we have never heard of a part in the hydraulic timing system wearing out. I guess that must be because they all work under oil."

LINE MATERIAL

Kyle® Reclosers

COMPLETE COORDINATED AUTOMATIC PROTECTION FROM SUBSTATION TO LOAD

More of what you want in CHEVROLET Advance-Design Trucks

—*and here are 4 powerful reasons why:*

NEW ENGINE POWER—TEAMED WITH LOWER COSTS! The improved Loadmaster engine with a new high compression ratio of 7.1 to 1, now delivers even more power. This great engine is standard on 5000 and 6000 Series heavy-duty and forward-control models—optional on 4000 Series heavy-duty models. In light- and medium-duty models the Thriftmaster engine offers traditional Chevrolet economy.

NEW STAYING POWER—FOR GREATER DURABILITY! Frames are heavier, stronger, more durable in all 1953 Chevrolet trucks. You'll find greater ruggedness and stamina. You'll find these trucks even brawnier and sturdier than Chevrolet trucks in past years—trucks that have long been famous for those very qualities. And this heavier construction brings new comfort and freedom from fatigue to drivers, too.

NEW BRAKING POWER—FOR QUICKER, SURER, SAFER STOPS! Two types of brakes on 1953 Chevrolet advance-design trucks provide greater stopping power and greater durability. "Torque-Action" brakes are standard front and rear on all trucks up to 4000 Series heavy-duty models. Extra-large "Torque-Action" brakes in front, "Twin-Action" type in rear are on Series 4000, 5000 and 6000 heavy-duty models.

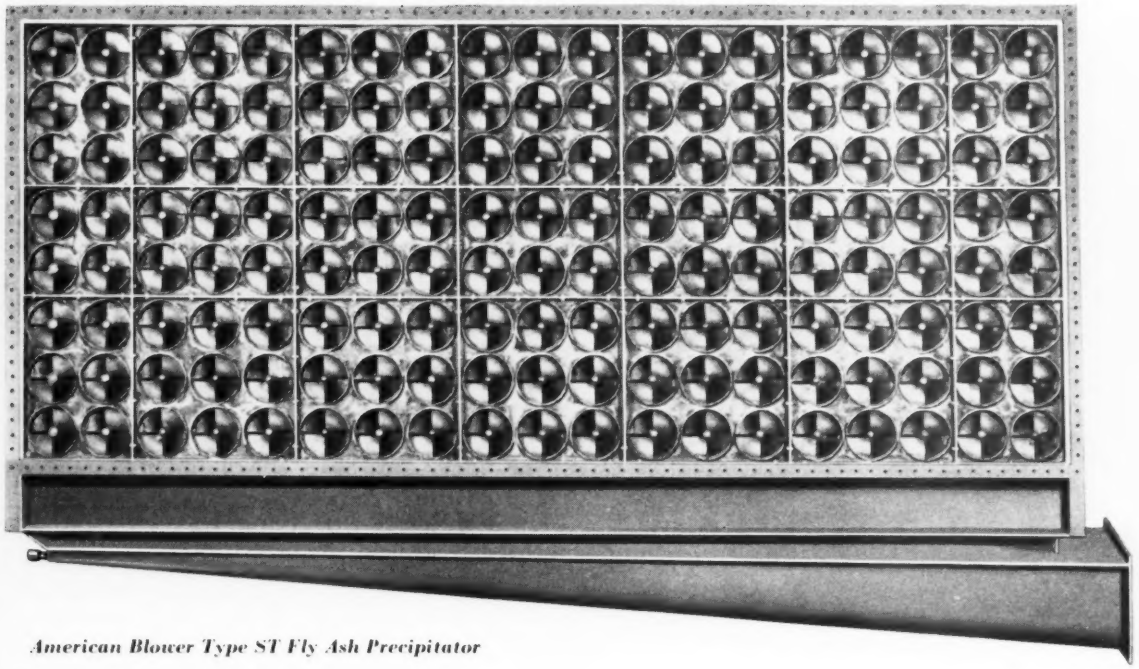
NEW ECONOMY—LOWERS COST OF EVERY TON-MILE HAULED! Expect greater economy with Chevrolet trucks. New and greater stamina with extra gasoline economy cuts operating costs, maintenance costs in heavy-duty models with Loadmaster engine. *And these great trucks list for less than comparable models of any other make!* Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTI-PANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

CHEVROLET

American Blower . . . a time-honored name in air handling



American Blower Type ST Fly Ash Precipitator

Memo to Power Plant Men—

In collecting fly ash from pulverized fuel-fired or stoker-fired boilers you'll have a higher efficiency curve over a wider range of operation if you install American Blower Type ST Fly Ash Precipitators.

AMERICAN BLOWER

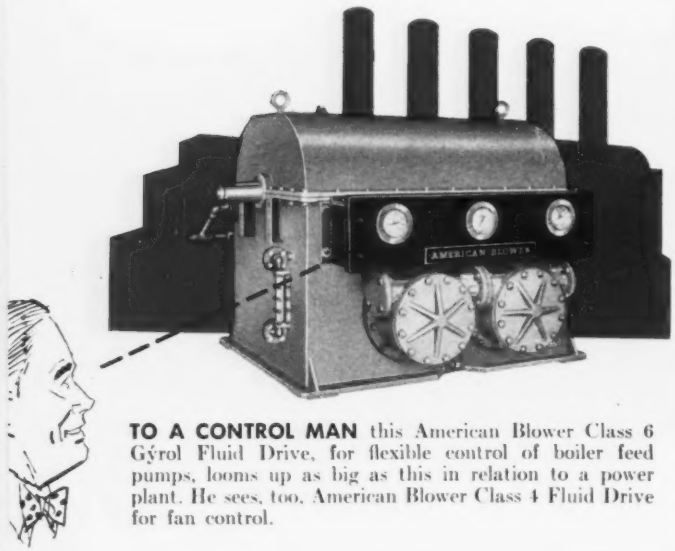
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

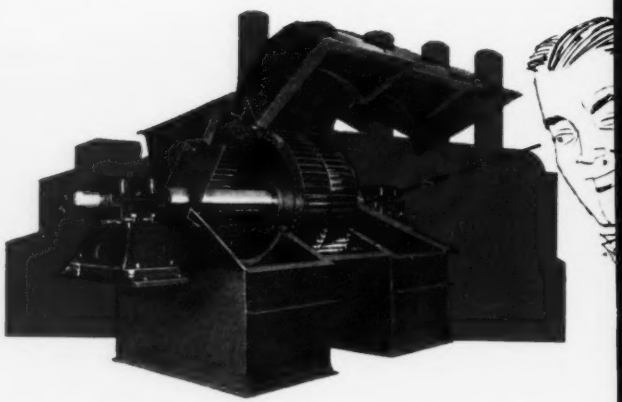
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

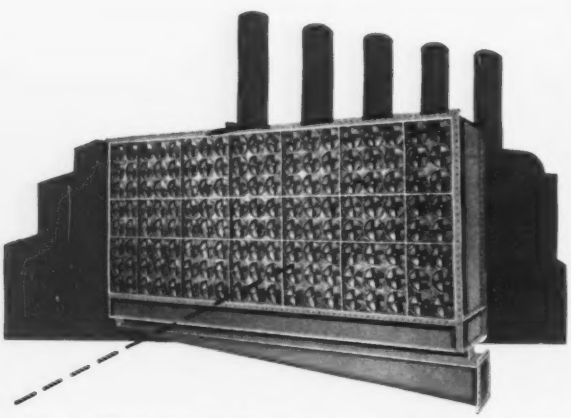
It all depends on how you look at it



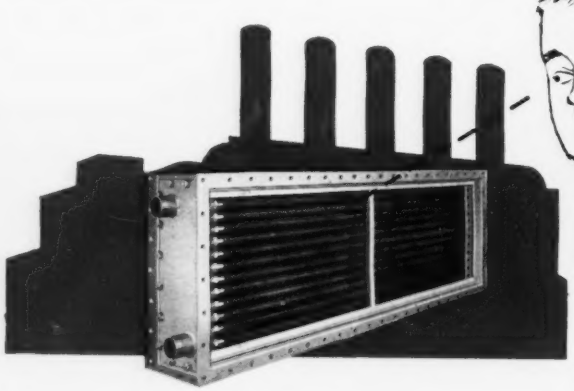
TO A CONTROL MAN this American Blower Class 6 Gyrol Fluid Drive, for flexible control of boiler feed pumps, looms up as big as this in relation to a power plant. He sees, too, American Blower Class 4 Fluid Drive for fan control.



TO A MECHANICAL DRAFT MAN a Sirocco Multi-Blade Fan, which delivers more gas per revolution than any other type, takes *this* proportion in the picture. He could see an American Blower HS Fan equally large if thinking of forced draft.



TO A FLY ASH EXPERT an American Blower Type ST Fly Ash Precipitator looks like this in relation to the rest of the power plant. Little wonder, for the Precipitator lifts a load off his shoulders and minimizes a nuisance.



TO A COIL MAN American Blower Heavy Duty Steam Coils would appear like this in his power plant picture. He likes their great strength, easy accessibility and the way they withstand the high pressures of heavy loads.

Looking at your complete power plant picture, we believe you'll find, as hundreds of others have, that all these American Blower Products improve over-all power-plant efficiency and insure years of dependable operation. Call our nearest Branch Office for complete data.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

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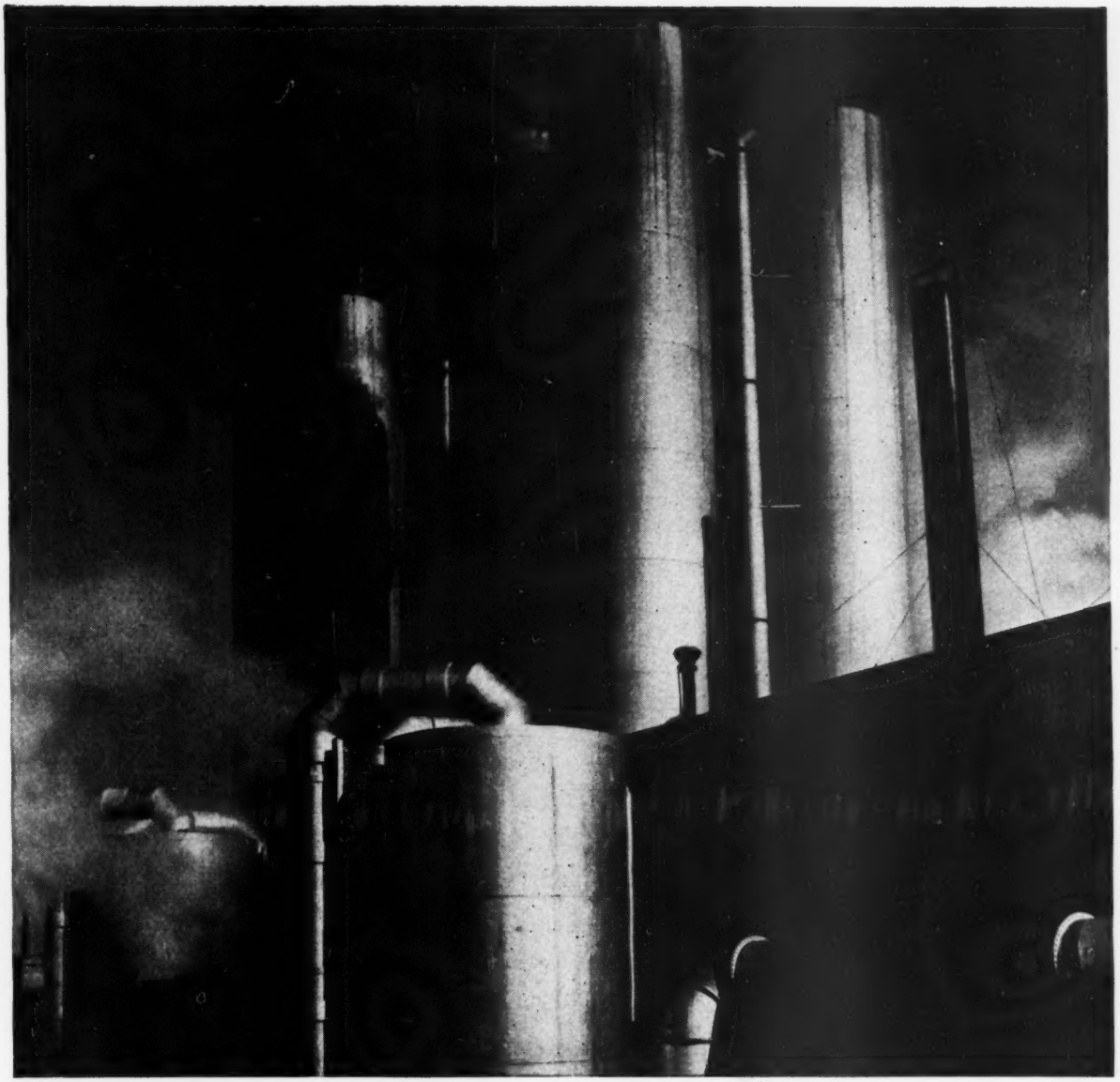


There's a special paint for places like this and it saves hundreds of dollars

When you get down to figuring how much it costs to paint a square foot of tank or stack, you find that the paint itself is only a small part of the cost. That's why experienced paint buyers select more quality aluminum paints for jobs like this than any other type.

Because so much aluminum paint is used for these places, special formulas have been developed. Paints made to these formulas stand up longer under heat, cold, sun, rain and the kind of corrosive fumes you find around mills and factories.

We don't make paint. But we make the Alcoa Aluminum Pigments that are used in more aluminum paints than any other brand. So we want to be sure that you get full value from the aluminum paint you buy. It's just good business for us.

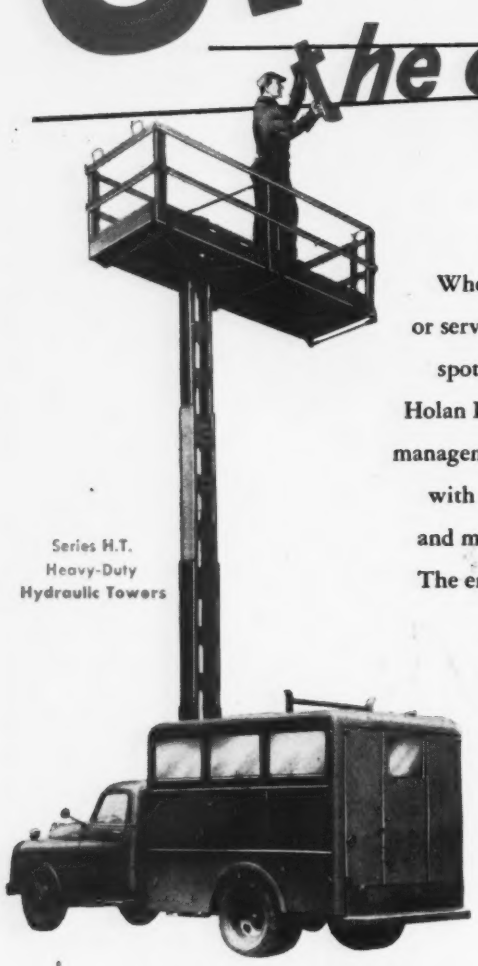
If you have a plant, or a stack, or storage tanks, or most anything else that needs paint that will last a long time, write us about your paint problem and we'll tell you what types of aluminum paints are best. We'll also send you a copy of *Painting with Aluminum*. It's packed with facts on selecting and using aluminum paints. Paint Service Bureau, Aluminum Company of America, 1787-D Alcoa Building, Pittsburgh 19, Pa.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

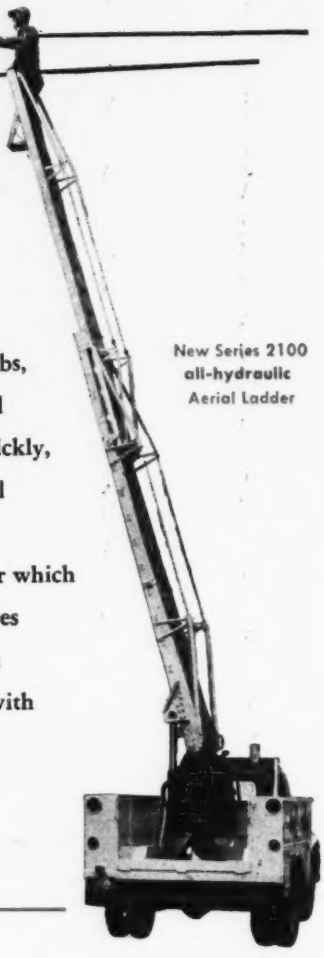
UP and at it!

the easy way



Series H.T.
Heavy-Duty
Hydraulic Towers

Wherever construction, maintenance or service personnel must be spotted quickly and safely on aerial jobs, Holan Hydraulics are favorite with men and management. They are raised and located quickly, with minimum effort. They are retracted and moved to the next job without delay. The engineered simplicity and strength for which the name Holan is famous assures a long life of low-cost, high-return service Towers or ladders, with choice of several sizes.



New Series 2100
all-hydraulic
Aerial Ladder

Holan Heavy-Duty hydraulic towers have stationary, rotary or transverse platforms. Extra rigid telescoping box channel type lift. A choice of models with maximum platform heights of 17', 23' 6", or 30'. All can be lowered to 10' 3".

In the new Series 2100 all-hydraulic ladder, every motion, rotation, elevation, extension *and retraction* is hydraulically actuated. Powered by integral gasoline engine, or by power take-off. Choice of 27', 31' or 35' *platform height*.

DISTRIBUTORS

Baker Equipment Engineering Co.
Summit and Norfolk Sts., Richmond, Va.

Baker Equipment Engineering Co.
2401 Hutchinson Ave., Charlotte, N. C.

Baker Equipment Engineering Co.
Shop Road, Columbia, S. C.

Schetky Equipment Corp.
1810 S. E. 10th Ave., Portland 14, Ore.

The dependable name in utility bodies

J. H. HOLAN CORPORATION

BODIES AND ACCESSORIES FOR UTILITIES
4100 West 150th Street Cleveland 11, Ohio

DISTRICT SALES REPRESENTATIVES

2754 N.-92nd Street
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Beechhurst, Queens, N. Y.

INSTALLED 1942

It has an Unmatched Field Performance Record of Trouble-Free Service!

This C-D 20,160 Kvar capacitor bank installed by a major northwestern power producer in 1942, has an outstanding record for low-maintenance operation. Another typical time-tested C-D installation!

Ask to have a C-D engineer point out the low-maintenance characteristics that are built into every C-D capacitor. Cornell-Dubilier Electric Corp., Dept. D-43B, South Plainfield, N. J.

CORNELL DUBILIER

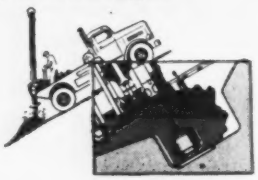
CONSISTENTLY DEPENDABLE

CAPACITORS

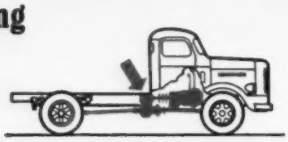
PLANTS IN SO. PLAINFIELD, N.J. • NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS. • PROVIDENCE, R.I. • INDIANAPOLIS, IND. • FUQUAY SPRINGS, N.C. • SUBSIDIARY, RADIART CORP., CLEVELAND, O.

FWD "Mobilized Tools" improve your service...year 'round

Only FWD's for line construction or maintenance give you these work-speeding and cost-cutting advantages



High-Climb Oil Sump keeps oil pump constantly submerged. An FWD exclusive that lets you bore holes, set poles on steepest grades or slopes.



Two-Speed Aux. Transmission
Doubles the number of transmission gear ratios. Provides low gear ratio for full power at extreme low speeds in tough, cross-country operations.

Fully Compensated Drive
Three free-acting differentials compensate for differences in travel of all four wheels. Reduces drive line strains, eliminates needless tire scuffing.

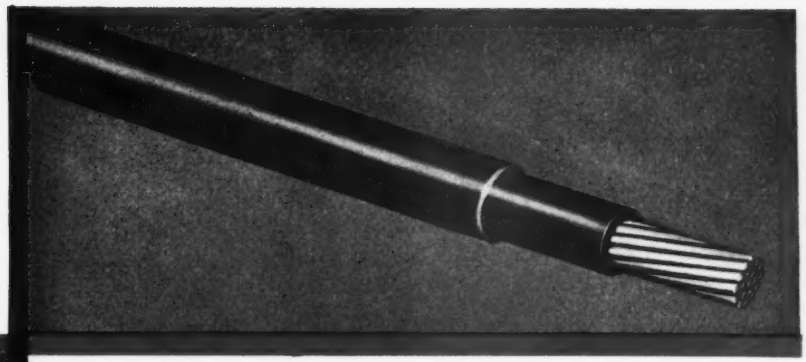
Full Torque P.T.O. ... Utilizes full engine power through all transmission speeds. Exclusive safety lock prevents truck drive while boring.

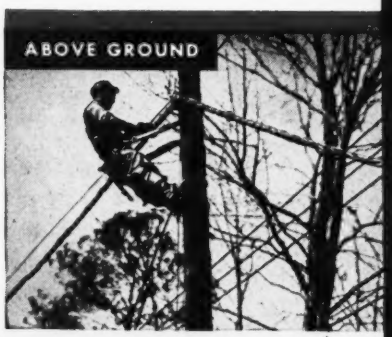
With extra traction and "go everywhere" mobility FWD "Mobilized Tools" for line construction or maintenance pay off for you in speed . . . to the job . . . on the job. And, you'll get all-weather service . . . greater safety for crews and equipment . . . longer, trouble-free life. When you use FWD "Mobilized Tools," you deal with only one source for service and supply.

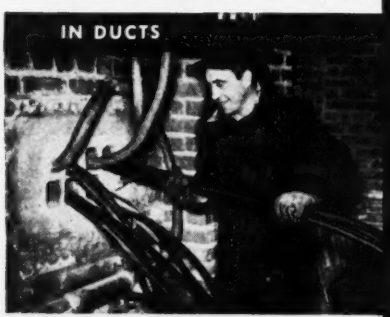
To get the facts . . . details on the more than 78 matched-combinations utilities can choose from . . . see your FWD Dealer or write direct.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin • *Canadian Factory*: Kitchener, Ontario

Built by the makers of America's Foremost Heavy-Duty Trucks







You can depend on neoprene-jacketed cable in all types of service

RURAL • RESIDENTIAL • INDUSTRIAL

Wherever it's installed, neoprene-jacketed cable gives long, trouble-free service. Above ground, neoprene-jacketed cable outperforms other types because of its unequaled resistance to deterioration from sunlight and weathering. In heavily industrialized areas, neoprene stands up in corrosive atmospheres . . . is ideal protection for both primary and secondary power cable.

Underground, buried direct or installed in ducts, neoprene resists attack from soil acids. Unlike metallic coverings, it is not damaged by electrolytic action caused by stray currents.

Cable manufacturers supply neoprene-jacketed cable in single and multiple conductor types in a range of voltage ratings. Since the same cable is often suitable for different uses, lower inventories are possible. And remember, a neoprene jacket assures longer life, fewer repairs, less frequent replacement even in the most severe service. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division EW-4, Wilmington 98, Del.

NEOPRENE

The rubber made by du Pont since 1931

DU PONT

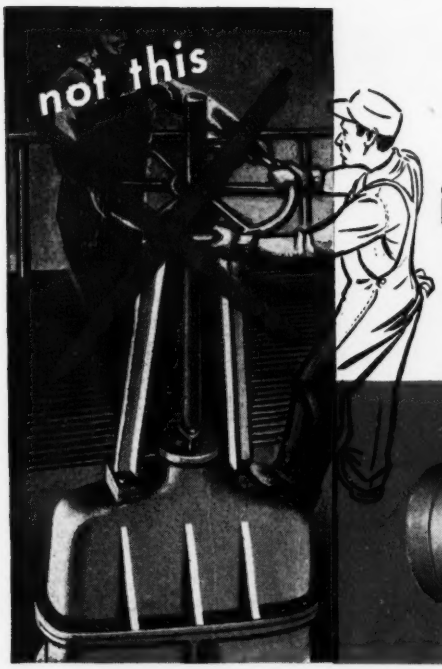
REG. U.S. PAT. OFF.

Better Things for Better Living . . . through Chemistry

This booklet marks our
forthcoming 50th Anniversary.
It answers the question . . .
"WHAT CAN WE DO FOR YOU?"
Send for your copy today.

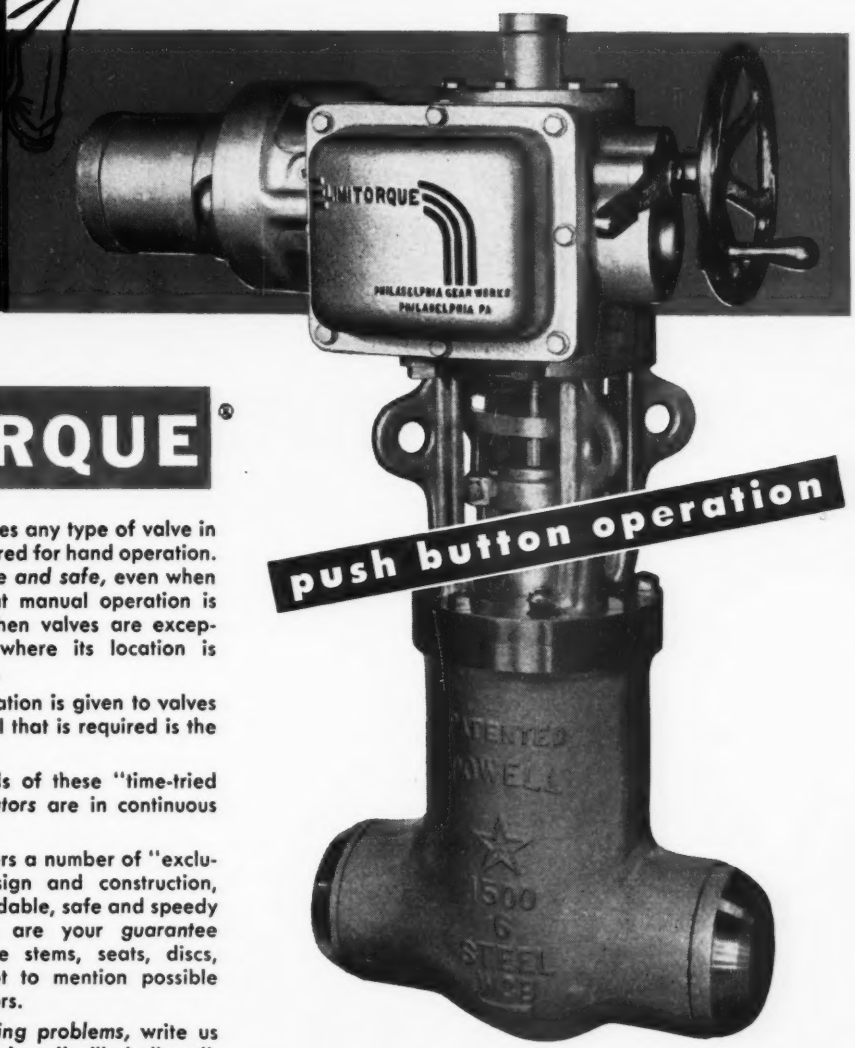
ROLLER-SMITH CORPORATION
AND ELPECO DIVISION
BETHLEHEM • PENNSYLVANIA

CIRCUIT BREAKERS • INSTRUMENTS • SWITCHGEAR • PRECISION BALANCES
WATTHOUR METERS • POWER SWITCHING EQUIPMENT • SUBSTATIONS • BUS DUCTS



Pushing a Button

is SAFER EASIER QUICKER



LIMITORQUE®

push button operation

LimiTorque opens and closes any type of valve in a fraction of the time required for hand operation. It is *absolutely dependable and safe,* even when pressures are so *high* that manual operation is almost impossible . . . when valves are exceptionally *hot* . . . and where its location is *hazardous* or *inaccessible.*

Yes, instant, positive operation is given to valves located miles away . . . all that is required is the push of a button.

Thousands upon thousands of these "time-tried and tested" *Valve Operators* are in continuous use, all over the world.

Of course, *LimiTorque* offers a number of "exclusive advantages" in design and construction, which not only give dependable, safe and speedy performance, but which are your *guarantee* against damage to valve stems, seats, discs, plugs, or gates . . . not to mention possible physical injury to operators.

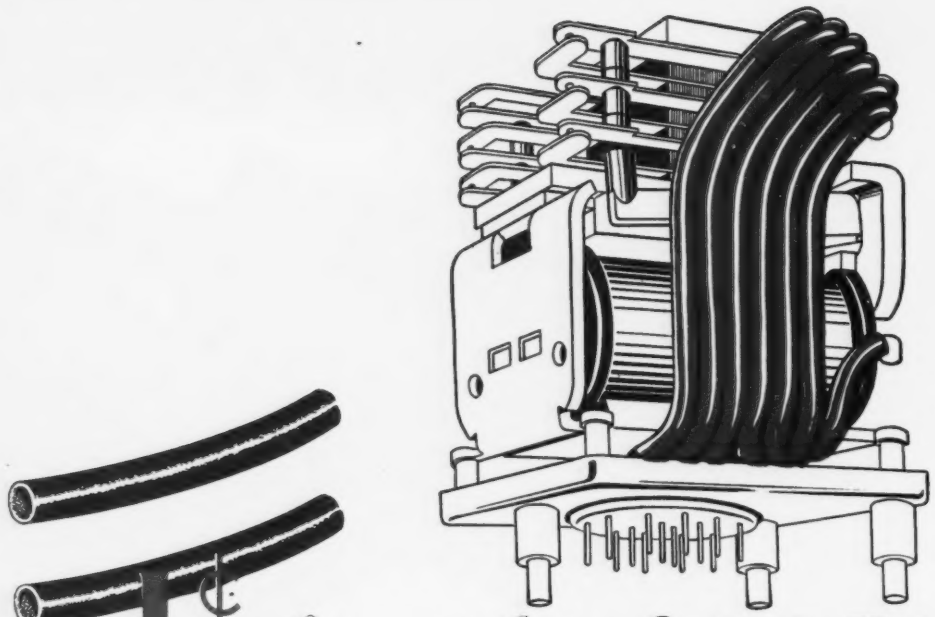
If you have *valve operating problems,* write us —and a "Philadelphia Engineer" will gladly call.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



T lengths of BH "649" for NEVER-FAIL Protection

When Struthers-Dunn, Inc., Philadelphia relay manufacturers developed their "181CXC100" Frame Relay for military and industrial applications they made exhaustive tests to find the "right" insulation for never-fail protection . . . it was BH "649" Fiberglas Tubing . . . and here's why . . .

"We selected BH Tubing because of the Hi-temperatures encountered in hermetically sealing our relays, and its ability to withstand flexing and still pass the hi-potential test."

The 181CXC100 uses 14 two-inch lengths of tubing . . . a small part of the manufacturing cost, but big insurance against failure.

BH 649, a vinyl-coated, braided Fiberglas tubing, is made flexible and stays flexible in continuous operation at temperatures ranging from minus 50°F. to 266°F. Superior flow-resistant characteristics permit exposure to processing temperatures of 325°F. plus, for eight hours or more — hot spot temperatures to 500°F., too. It is rated up to 7000 volts, has excellent chemical and oil resistance, and is available with inhibitors for fungus protection.

You can easily get full information on BH "649" — and the other superior BH Fiberglas Tubings and Sleevings. Send us facts on your requirements, voltages and temperatures encountered. We'll make recommendations and send you free production testing samples.

Address Dept. W-4

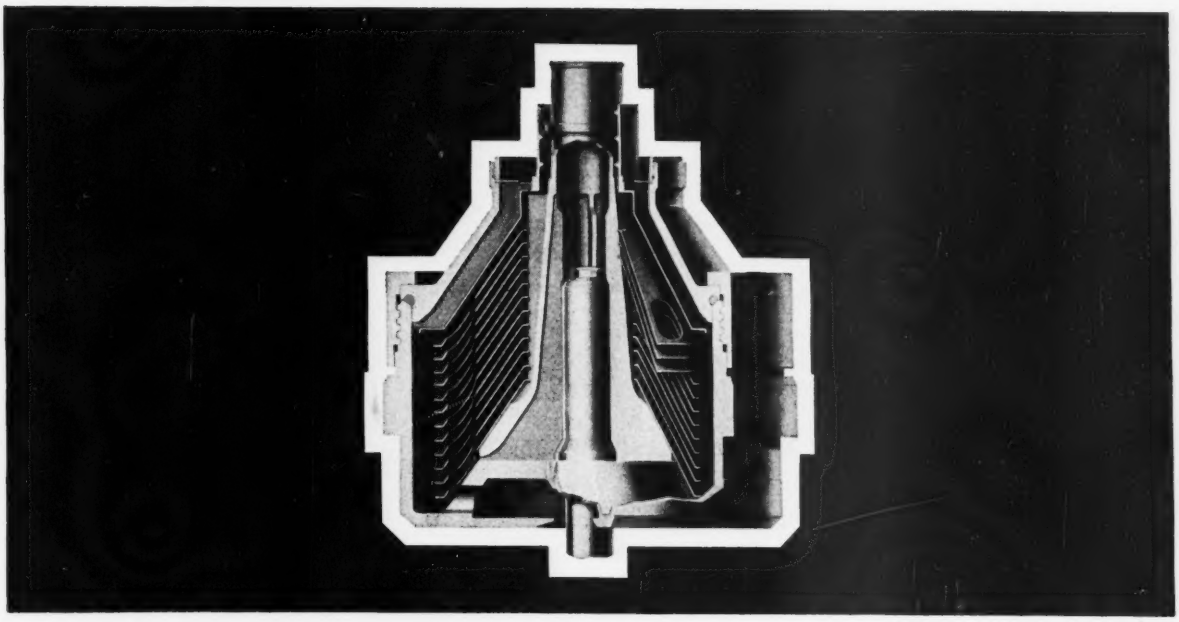
Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH FIRST . . .

in use of Fiberglas
in heat-treated Fiberglas
in true high temperature flexibility
in vinyl-coated Fiberglas
in silicone rubber coating
in colors in silicone rubber
in true Class B (130°C.) protection

BH Fiberglas* SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

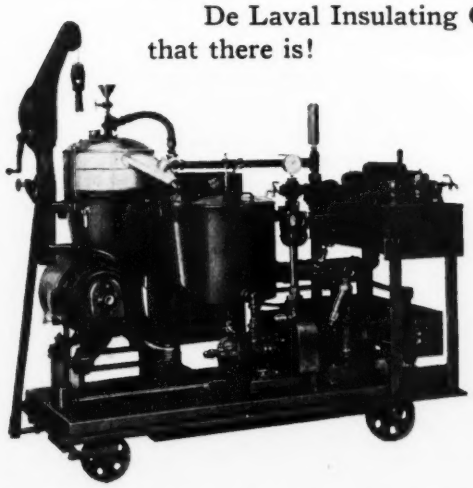


SAFEST MEANS IN THE WORLD FOR RESTORING DIELECTRIC!

This is a sectional view of a De Laval Insulating Oil Purifier bowl. Wet oil, entering the bowl at the top, rises through the holes in the discs and is promptly dehydrated. Water is thrown to the periphery and continuously discharged to waste. Clean, dry oil rises to the top and is also continuously discharged.

De Laval Insulating Oil Purifiers enable power engineers to be sure that their insulating oil is ***completely*** safe for reuse. Restoral of the dielectric is accomplished in one pass through the centrifuge—at ***low*** temperature. Such low temperature purification has another advantage—it prevents rapid reduction in dielectric strength of the oil after purification.

De Laval Insulating Oil Purification is the ***safest*** means of maintaining oil that there is!



THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

DE LAVAL

INSULATING OIL PURIFIERS

LOOK FOR THIS DISPLAY AT YOUR DISTRIBUTOR'S
Inspect the New SPANGLEAM finish
TEST THIS SAMPLE
Feel -ITS LIGHT WEIGHT -ITS STRENGTH -ITS SURFACE
NOW SPANG EMT ...THIN WALL CONDUIT
SPANGLEAM
FINISH AT NO EXTRA COST !
INSIDE IMPROVED OUTSIDE
AVAILABLE IMMEDIATELY IN THE FULL RANGE OF 6 SIZES - ½" - ¾" - 1" - 1¼" - 1½" and 2"
Easier to cut and bend ! ....faster to install !

. . . now available—at no extra cost—on Spang EMT thin wall conduit!

Check These Points:

1. NEW FINISH OUTSIDE

. . . specially-processed electrogalvanized exterior . . . highly resistant to smudge, abrasion, corrosion . . . provides neat, attractive appearance in exposed installations.

2. NEW FINISH INSIDE

. . . new smoother protective coating of resinous lacquer compounded with Zirconium . . . provides easier wire pulling, assured grounding, corrosion resistance.

3. LIGHT WEIGHT—STRONG

. . . the same Spang top-quality EMT thin wall conduit . . . easy to cut, bend, install; built from high-grade steel for years of service in permanent installations . . . BUT, now with the SPANGLEAM finish it's cleaner, easier to handle, easier to maintain.

4. AVAILABLE

. . . SPANGLEAM finish is available immediately in the full range of six sizes—½", ¾", 1", 1¼", 1½" and 2".

LET SPANGLEAM HELP YOU

- make better installations
- make work easier
- build profits

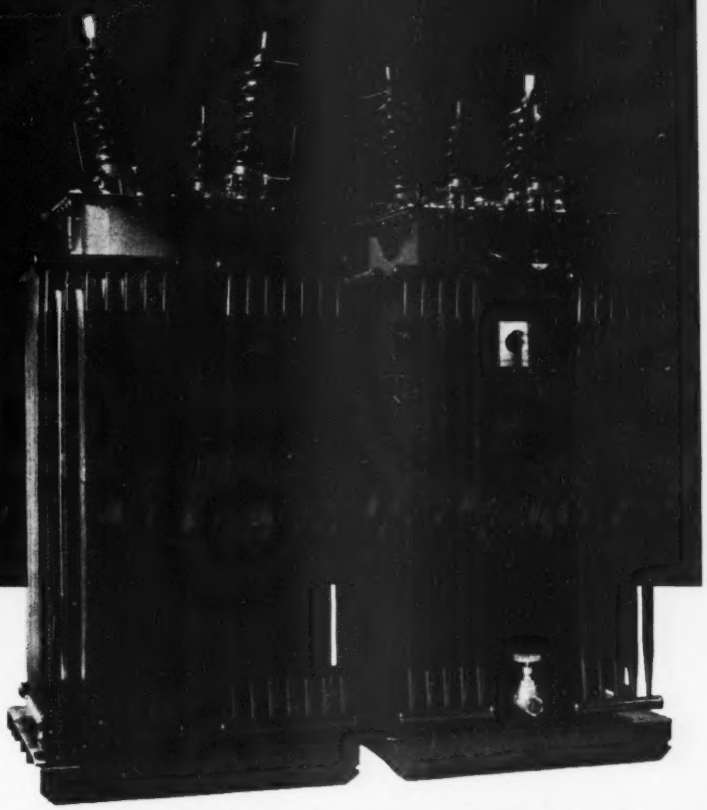
TAKE A LOOK AT SPANGLEAM TODAY! THEN TRY IT!

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities

UPTEGRAFF DISTRIBUTION TRANSFORMERS

means longer-life low maintenance



Tight sealing that prevents "breathing" and the entrance of moisture, prolongs the service life of Uptegraff Transformers. Oxygen and moisture are found to be the principal causes of oil deterioration. All flanges and openings are so effectively sealed, that even the keen perception of the super-sensitive electronic Leak Detector does not find any sign of leakage.

This is only one of many features that give Uptegraff Transformers exceptionally long life expectancy, and reduce maintenance costs.

Uptegraff makes distribution transformers in all commercial ratings, from 3 KVA to 500 KVA, and in a complete series of dry type air-cooled designs, as well as the liquid-filled units.

Every liquid-filled Uptegraff Distribution Transformer is checked by the electronic Leak Detector before shipment. The photograph above shows front and rear views of a single phase, 60-cycle, 26,400–13,100Y/7560 volts, 500 KVA transformer.

R. E. UPTEGRAFF MANUFACTURING COMPANY

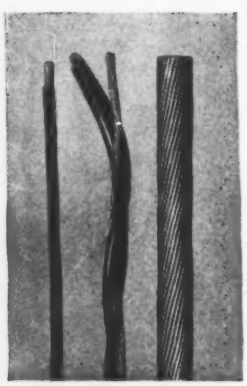
Scottdale, Pennsylvania

THERE'S A KAISER ALUMINUM EC DISTRIBUTOR CONVENIENTLY LOCATED TO SERVE YOU

City Electric Distributors, Inc.
Central Electric Supply Company, Inc.
Capital Electric Supply
Crescent Electric Supply Co.
Dauphin Electrical Supplies Company
Dutton-Lainson Company
Eoff Electric Company
Electrical & Mechanical Supply Corp.
Florida Electric Supply, Inc.
George H. Wahn Company

General Electric Supply Corporation
Hunzicker Brothers
Interstate Electric Co. of Shreveport, Inc.
Line Material Company
Maydwell & Hartzell, Inc.

Mine & Smelter Supply Company
Nelson Electric Supply Company
Price Electric Company
Russell Beldon Electric Company
Stuart C. Irby Company
Stubbs Electric Company
Tafel Electric & Supply Company
The Korsmeyer Company
Virginian Electric, Inc.
Westinghouse Electric Supply Co.



Take advantage of the many services offered by your nearby Kaiser Aluminum ECDistributor. Here are a few:

- He has available large stocks of Kaiser Aluminum Conductor.
- He insures fast delivery to help reduce your inventory.
- His specialized knowledge helps solve your individual problems.
- He provides top-notch engineering services.
- He keeps you abreast of latest developments and techniques.
- He gives you friendly, personal attention on any size order.

NEOPRENE AND POLYETHYLENE COVERED CONDUCTOR, SOLID AND STRANDED • SELF-SUPPORTING TRIPLEX CABLE • ACSR ALL ALUMINUM CONDUCTOR

Kaiser Aluminum

setting the pace—in growth, quality and service

THE WESTINGHOUSE CURRENT COIL DESIGN

gives you longer meter life

The current coil in your meters is important because it directly affects meter accuracy. Westinghouse has made a major coil improvement by adopting a new insulating material with a three-times-higher insulating level than previous materials.

Long-range meter accuracy—This new insulation is especially good for corrosive atmosphere and it resists breakdown under extreme heat, cold or moisture. This means no current coil failure and long-range meter accuracy.

Stands 3-month brine test—In testing this new material, coils were immersed in a strong brine solution for three months. Then they were given a 12,000-volt test. The insulation stood up perfectly!

Two months in a bake oven—Next we put the material in a 212° F oven for two months. After this rigorous test it was still flexible and passed all physical and electrical tests.

Soldering terminals—The terminals of this coil are solderless. There's no possibility of poor soldered connections.

Get more information—This new coil is one of several important refinements recently made in Westinghouse meters. Write for informative booklet B-4665, *What It Takes for Long-time, Low-cost Metering*. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-40445

Everything you need in meters and instruments

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Use of G-E Super Coronol* Cable helps solve difficult cable layout problem

Installation speed important feature of G-E interlocked armor cable system

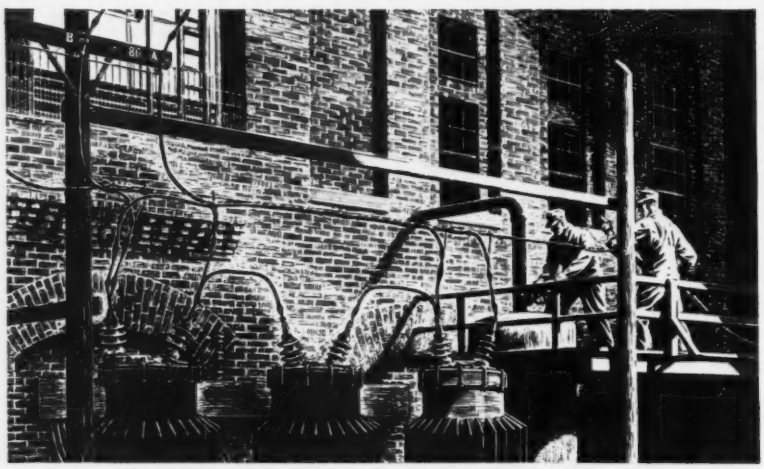
Here's a thought for rewiring plants in a hurry, keeping costs in line, and possibly maintaining production at the same time: Investigate the G-E V-c interlocked armor cable system.

The ease and speed with which this interlocked armor cable system can be installed lowers costs. The cable can be laid quickly—indoors or outdoors—in long lengths, around corners, on low-cost aluminum racks. Engineering time is cut. Threading or bending of conduit is eliminated. Splices are of a simple, mechanical type. Many plants have saved months, not days, because of these features.

Permanent

To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure. The cable is versatile as well as permanent and makes a neat, clean-looking installation. A booklet that describes the G-E No. 1799 varnished-cambric-insulated interlocked armor cable system is available.

Flexibility of interlocked armor cable is demonstrated here—corners and projections present no installation problems.



The cable layout for these transformer leads was suggested by a G-E wire and cable specialist. The layout resulted in an important improvement in safety and appearance.

Ionization testing standard G-E procedure

In order to make certain that the cable has been properly constructed, G. E. makes an ionization test of every foot of Super Coronol cable rated over 5 kv. This is standard practice. Even continuous lengths as long as 3100 feet have been tested on special equipment made for this purpose. It is tests like these that help to insure the dependability of all G-E cable. If you wish, a G-E wire and cable specialist can furnish additional information about ionization testing.

USEFUL BOOKLET

In one handy booklet you get informative data on G-E Versatol* Geoprene cable's installation and maintenance economies. The booklet, Pub. No. 19-390, can help you determine applications for these dependable, general purpose cables. Write for your free copy today.

Registered Trade-mark General Electric Company

On any cable problem you can get prompt, expert help from your G-E wire and cable specialist. Here is an example. In the Omaha Public Power District a local brewery was confronted by this hazard—bare wire was used for the drops from an overhead 13.2-kv line to transformers. Liquid waste from vats kept the air moist. And with an elevated platform nearby, it was possible for men working on a condenser to get too close to the high voltage for safety.

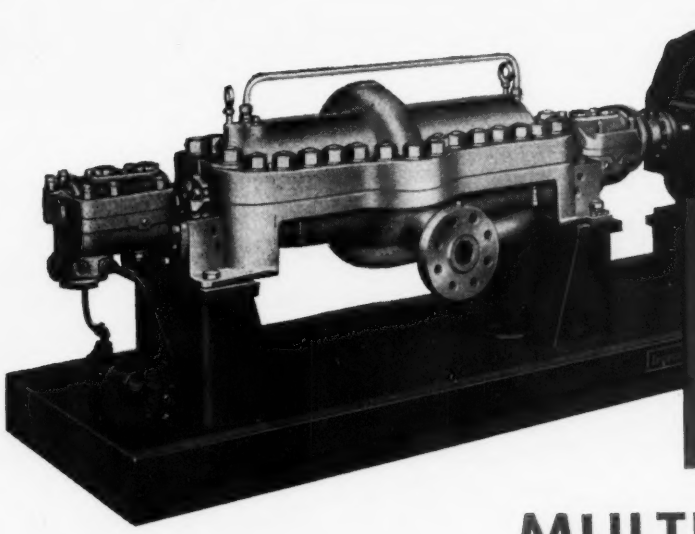
In looking for the answer, the Power District asked the G-E Construction Materials Omaha office for a cable layout. The G-E wire and cable specialist submitted one—based on the use of 15-kv Super Coronol Geoprene cable. This cable, which is shielded, not only eliminated the danger from bare wires, but improved appearance as well. Because the cable was preformed in the utility's service shop, and terminations made in advance, installation was made with a minimum of shutdown time.

The next time you have a question on cable or want any of the booklets mentioned in this advertisement, call a G-E wire and cable specialist for expert help. You can reach him at the nearest G-E Construction Materials district office. Or, write Section W68-427, Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

You can put your confidence in—

GENERAL ELECTRIC

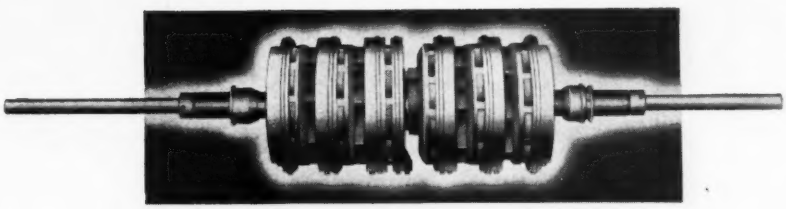
75 YEARS OF ELECTRICAL PROGRESS



Ingersoll-Rand

CNTA

MULTI-STAGE PUMPS



extend the advantages of the

UNIT-TYPE ROTOR ASSEMBLY

HIGHER SUSTAINED EFFICIENCY

Greater simplicity of design, with precision-matched impellers and channel rings, permits unusually high efficiency which is sustained throughout years of operation.

GREATER DEPENDABILITY

Radial balance with multiple-volute design and axial balance with opposed impeller grouping, assure long trouble-free operation. The smooth-bore, symmetrical outer casing eliminates any possibility of distortion under high temperature operation.

REDUCED MAINTENANCE

Entire rotor assembly can be removed from the casing as a single, compact unit, without disturbing piping connections. There are no ring fits to align on replacement of the rotor assembly.

to your medium pressure applications

• With the completely re-designed line of CNTA multi-stage pumps, Ingersoll-Rand offers a new high in performance, efficiency, dependability and economy—for medium-pressure boiler feed, mine dewatering, marine, petro-chemical and general hydraulic services.

The advanced design Unit-Type rotor assembly, with impellers and channel rings mounted on a single, heavy-duty shaft and with a smooth-bore outer casing, is the same type as that used by Ingersoll-Rand in the high-pressure CHTA and HMTA lines. The result of this modern construction is a dependable, simpler and more rugged unit that requires minimum attention and maintenance.

CNTA pumps are multi-stage, horizontally split units, with single-suction impeller groups placed back-to-back to eliminate hydraulic thrust. They are available in 4, 6 and 8 stages for pressures from 100 to 800 psi, in capacities from 50 to 700 gpm.

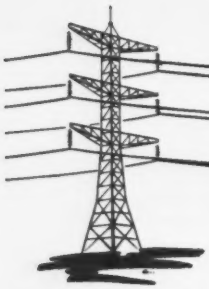
Your I-R representative will be glad to give you the *complete story.*

Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York 4, N. Y.

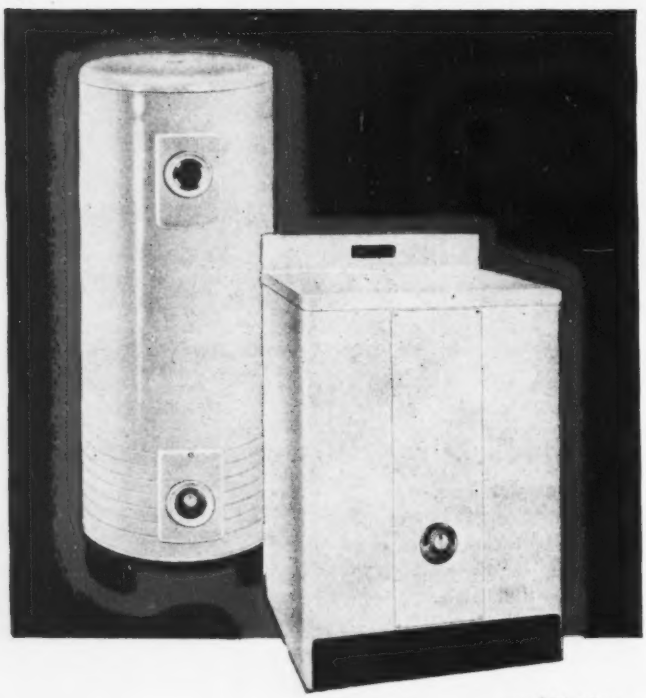
844-10

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES



Hotpoint

Automatic Electric Water Heaters



Build Greater Demand For Electric Water Heating—Thus, Greater Revenue for Utilities!

Hotpoint pioneered the electric water heater and has produced more than one-third of all those in use today . . . over one million. Features developed by Hotpoint for more efficient heating of water have been a strong factor in establishing today's demand for electric water heaters.

Hotpoint's Electric Water Heater Line, a full range of sizes in round and table-top models, offers a water heater for every domestic need. Hotpoint's famed MAGIC CIRCLE® heat with Calrod® heating units provides one of the most rapid methods of heating water. Have your Hotpoint distributor give you the complete story on the revenue potential that Hotpoint Electric Water Heaters provide today—and in the years ahead.

Again Hotpoint looks at Tomorrow, Today

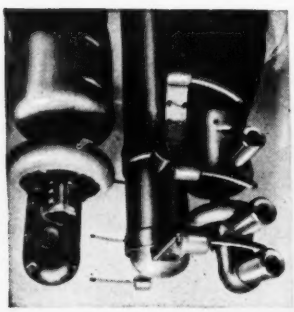
Advanced Protective Performance ...Extreme Simplicity of Design

138- to 230-kv 3-cycle
115-kv 5-cycle
(Also other styles, 7.5 kv and up)

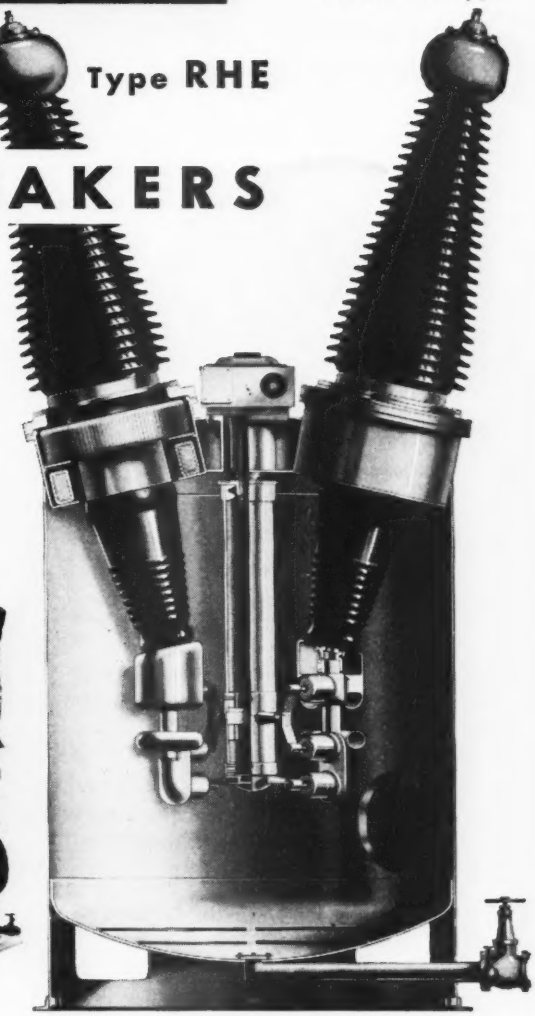
PACIFIC ELECTRIC Type RHE
HIGH-SPEED RECLOSING

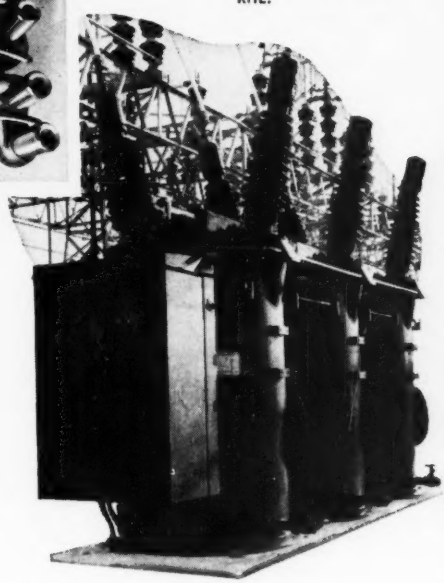
CIRCUIT BREAKERS

to 10,000,000 Interrupting Kva (at 161 and 230 kv)



At right: Sectional Elevation of 196/230-kv Type RHE.





Above: Interior of Tank, Showing Blades and Interrupters—Circuit Breaker Open.

At right: Type RHE in OKLAHOMA (138 kv).

NEMA and ASA STANDARD

A ONE-PIECE Six-break rotary blade unit is all that moves within the tank of a PACIFIC Type RHE oil circuit breaker.

Interrupters are of simple self-pressurizing type; their exceptional performance is due to improved utilization of directed oil flow and high speed of developing open-gap distance. The configuration of interrupter assemblies also permits use of the simplest method of obtaining voltage division between the six breaks in series per pole—capacitance grading shields.

Many fault interruptions on a symmetrical or asymmetrical (A.S.A.) basis—including a series of tests extending to 9,600,000 kva at 240 kv (A.S.A.)—confirm the ratings of these interrupters.

These and other advanced features contribute to low maintenance cost, ease of adjustment, and reliability of operation.

Write for Catalog 585

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA
OTHER FACTORIES: SANTA CLARA, CALIFORNIA; GARY, INDIANA

Since 1906

SALES OFFICES or AGENCIES in PRINCIPAL CITIES

WHY IS THIS STRAIN CLAMP SPECIFIED FOR DEAD-ENDING?

DUW-A

In overhead distribution applications where clearance between phases is limited, this Burndy straight-line strain clamp insures rapid installation, dependable performance and easy re-sagging because:

- Superior alloys and structural design provide maximum strength, permit high tightening torque—with minimum bulk.
  Holding power on aluminum or copper conductors always exceeds 90% of rated breaking strength of the conductor, and in most cases equals the rated strength. (Can also be used on ACSR; refer to Burndy for details.)
- Maximum holding power — without injury to conductor. Saddle under U-bolts distributes clamping pressure uniformly. Tapered front end of groove permits gradual pickup of stress from conductor to clamp. Belled saddle and groove entrances prevent nicking or abrading the conductor strands.
- Long neck facilitates carrying through of jumper loop.
- Design eliminates pockets where water might accumulate —guarding against corrosion.

Aluminum cable to 1510.5 Mcm—Copper to 2000 Mcm.

Consult—"Connectors for Aluminum Cable in Overhead Distribution," Catalog AL53.

BURNDY

NORWALK, CONNECT. FACTORIES: New York • California **TORONTO, CANADA**

EXPORT: Philips Export Corporation

53-3

there's more to Service Station Lighting than first meets the eye!

Here's How Benjamin is alerting Gasoline Service Station Operators to the importance of Service Station Lighting. Tie in with this appeal, currently featured in advertisements like these, running in SUPER SERVICE STATION and NATIONAL PETROLEUM NEWS! For further details and supply of literature offered in this ad, write: Benjamin Electric Mfg. Co., Dept. K, Des Plaines, Illinois.

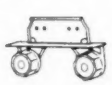
Lighting units that look alike may vary greatly in performance

These features of the BENJAMIN "Angle Vapor-Tite 40" Fluorescent Unit illustrate why there's more to Service Station Lighting than first meets the eye!

SEAMLESS, ONE-PIECE PORCELAIN-ENAMELED STEEL HOUSING . No cracks or crevices; no place for rust to get a foothold.

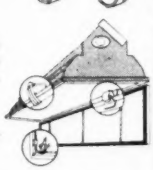
UNBROKEN SURFACE OF NON-POROUS, FLINT HARD PORCELAIN ENAMEL. No pores or cracks for dirt to gather . . . easy to clean with soap and water.

EXCLUSIVE BENJAMIN "SPRINGLOX" LAMPHOLDER. Speeds relamping through patented spring construction. Electrically dependable and safe . . . defies humidity.



EASY TO OPEN AND CLOSE. Simplified, hand-operated spring-type clamps unsnap in a jiffy. Three strong hinges keep cover aligned. Cover cannot fall off.

SEALED INTERIOR . Extruded rubber gasket seals out dirt and moisture.



ADAPTABLE to your mounting requirements! May be mounted three different ways to provide best possible light wherever illumination from the side is necessary.

You wouldn't have much trouble choosing the right one, if every lighting unit carried a tag telling you . . .

- **how long you can expect the unit to last . . .**
- **how much it will cost to operate per year . . .**
- **what maintenance will be necessary to keep getting original light output . . .**
- **how efficient the unit is from the standpoint of performance.**

However, the fact of the matter is that most service station lighting units tend to look alike. This outward resemblance may lead you to believe that there isn't much difference between them. That is one reason why there's more to service station lighting than first meets the eye.

It takes a trained eye to see the difference between lighting units. Listed and illustrated here as an example, are just a few of the points to watch when selecting units for wash rack lighting. Equally important points of difference apply to every type of lighting unit you may use in your station.

That's why it's good business to consult a man who knows service station lighting, such as your qualified Benjamin Electrical Contractor. If you prefer, write us for FREE Service Station Idea Scrapbook and Data Bulletins on Benjamin Service Station Lighting Units. Benjamin Electric Mfg. Co., Service Station Planning Dpt. K, Des Plaines, Ill.

BENJAMIN

Service Station Lighting Equipment

sold exclusively through electrical distributors

G 6067EW

PLANTÉ

The Battery That Never Grows Old!

Buy Planté and you'll be amazed at the number of years they'll stay in continuous, active service. In fact, if you purchase these *pure lead* batteries today, chances are you will retire before *they* need replacement. These "Aristocrats of Stationary Batteries" have the lowest per annum cost of any battery on the market!

You may be able to save up to 50% on maintenance costs throughout the life of your stationary batteries through the use of the Gould Plus-Performance Plan. Write Gould Battery Information Headquarters for full details.

Gould Planté—America's Finest Stationary Battery!

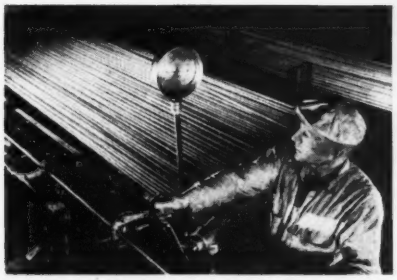
GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

Chase Antimonial Admiralty

(a patented alloy)



Every Chase Antimonial Admiralty condenser tube is tested to withstand at least 1,000 pounds per square inch water pressure.

Meets every test for Condenser Tubes

Chase flattening test, index of Antimonial Admiralty tube's physical quality and ability to withstand bending or end flaring.

This Chase metallurgist is checking the size and uniformity of grain of Chase Antimonial Admiralty condenser tubes.

When you put Chase Antimonial Admiralty* tubes into a condenser you *know* they'll stand up for years. It isn't only that we make certain there's enough antimony to resist dezincification. Chase condenser tubes are carefully tested and retested for *every* physical and chemical property required to meet actual field conditions. It pays to insist on Chase Antimonial Admiralty.

*U. S. Pat. No. 2,061,921

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(†sales
Cincinnati	Indianapolis	New Orleans	St. Louis	office only)

"TRANSFORMERS?

We like to do business with

Central

It's a fine new corporation with a grand old reputation!"

7 Reasons for Superiority of Central Transformers

- *Skilled, Conscientious Workmanship*
- *Tried-and-Proven Dependability*
- *Trouble-Free Performance*
- *Minimum Maintenance*
- *Long Life*
- *Reputation—Thousands in Use*
- *Prompt, Efficient Service*

A TYPE FOR EVERY NEED

Transformers in sizes from 3 KVA to 10,000 KVA, up to 115 KV primary class.

Photo below: A shipment of Central 2000 KVA Transformers; 26.4 KV Primary to 480 volt Secondary.

Central
TRANSFORMER CORP.
FORMERLY LARKIN LECTRO PRODUCTS CORPORATION

PINE BLUFF, ARKANSAS
SALES OFFICES IN PRINCIPAL CITIES

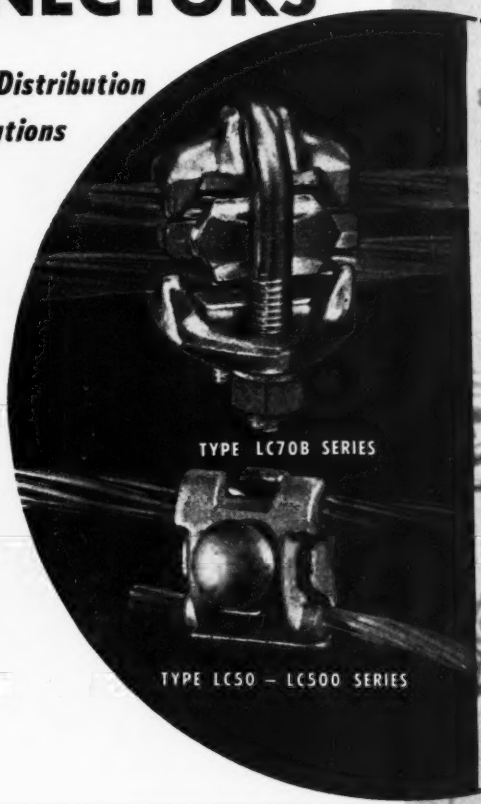
New

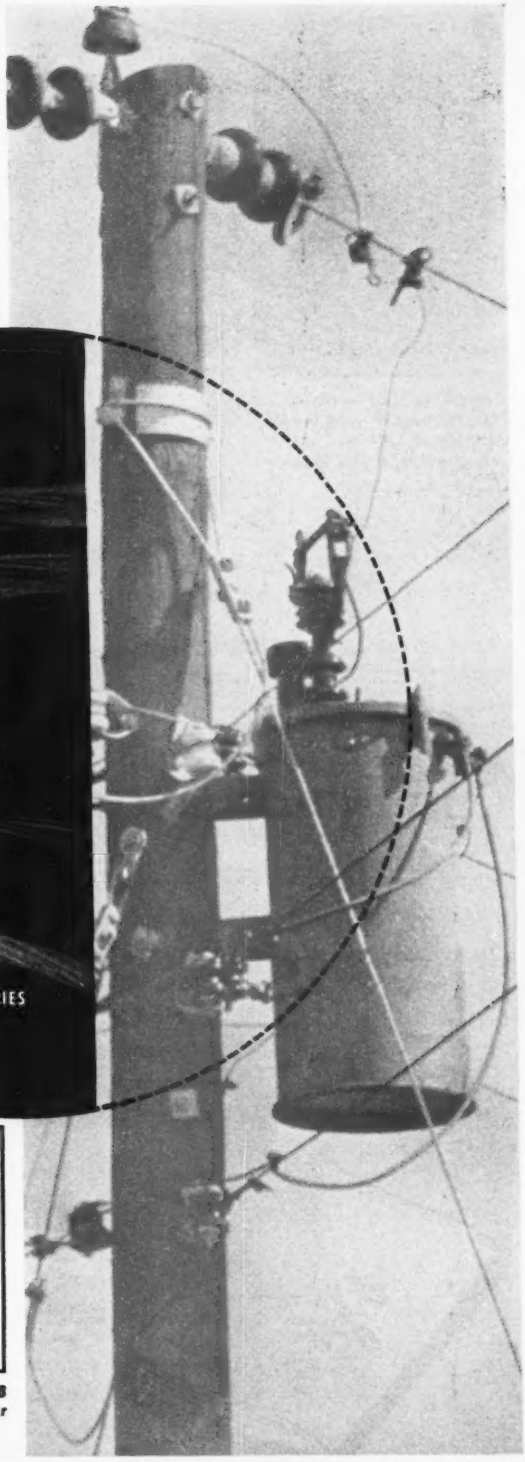
Anderson

TYPE LC50 – LC500 – LC70B SERIES

ALUMINUM CONNECTORS

For Wider Aluminum Distribution System Applications





- ***Inventory Reduced*** – Increased range, fewer connectors to stock, less cost.
- ***Dependability Assured*** – For more than a quarter century a leader in engineering and manufacturing aluminum connectors.
- ***Controlled Quality*** – From ingot to finished product.

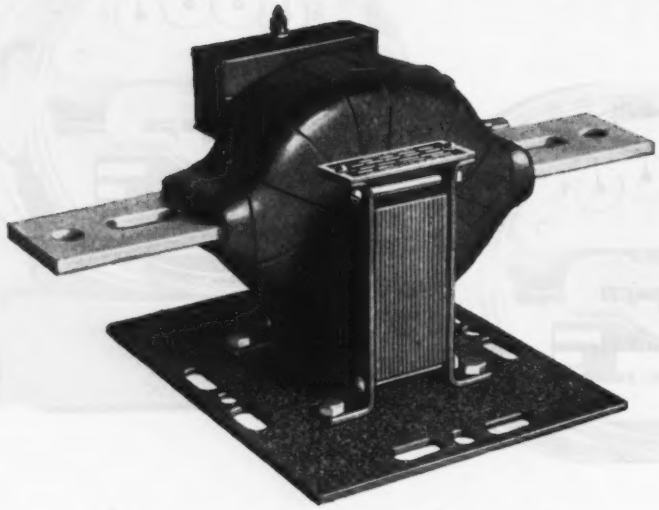
CATALOG NUMBER	MAIN	TAP
LC-51A	#6–1/0 ACSR	#6–#2 ACSR
LC-52A	#6–1/0 ACSR	#6–1/0 ACSR
LC-511A	#6–1/0 ACSR	#8–#2 COPPER CABLE
LC-522A	#6–1/0 ACSR	#8–1/0 COPPER CABLE
LC-70B	#6–#2 ACSR	#6–#2 ACSR
LC-71B	#6–1/0 ACSR	#6–1/0 ACSR

Consult one of our nearest 18 representatives or contact our main office.

manufacturers of quality
POWER CONNECTORS
•
CLAMPS
•
FITTINGS and ACCESSORIES for
SUBSTATION — TRANSMISSION — DISTRIBUTION

ABW

Anderson Brass Works
INCORPORATED
BIRMINGHAM 1, POST OFFICE DRAWER 2121 ALABAMA



Meters that tell the truth ...

DEPEND ON ACCURATE INSTRUMENT TRANSFORMERS

... and accuracy is the watchword at The Standard Transformer Company, where Current, Potential and Metering transformers are built to meet the highest NEMA, AIEE and EEI requirements.

Most economical to use . . . type NAS current transformer (shown above) enables users to stock only a few sizes to cover the entire field of low voltage measurement. This is just one of the complete line of instrument transformers that are "Standard-built" to save you money.

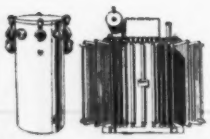
Write for BULLETIN S-501-B . . .

It's New

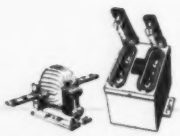
Packed with technical information on Current, Potential and Metering transformers, a 32-page bulletin complete with detailed drawings, accuracy limits, ratio and phase angle curves is ready for you. Every type of instrument transformer produced by The Standard Transformer Company is illustrated and described fully. You can have Bulletin S-501-B on your desk by merely writing for it today.

Transformers

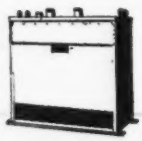
FOR EVERY APPLICATION



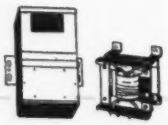
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



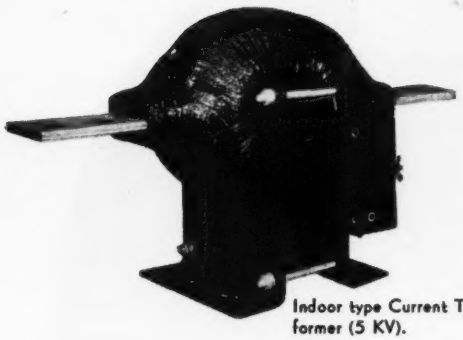
Instrument transformers (for use on circuits up to 72,000 volts, inc.)



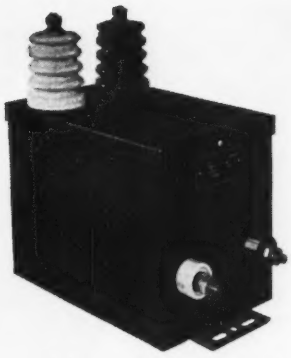
Dry type (up to 1000 KVA and max. voltage ratings of 4800.)



Control transformers (compound filled or open type.)



Indoor type Current Transformer (5 KV).



Indoor type unfused Potential Transformer 200 VA, 2400/120 volts, 60 KV FW impulse level.

Indoor type Potential Transformer with Current limiting fuses, 200 VA, 2400/120 volts, 45 KV FW impulse level.

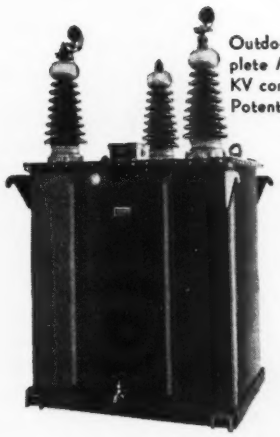
Standard

TRADE MARK ®

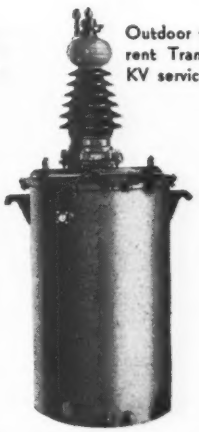
CURRENT, POTENTIAL AND METERING TRANSFORMERS

. . . Indoor and Outdoor Current and Potential Transformers . . . Metering Sets . . . Instrument Transformers for Special Applications.

Outdoor type, OISC Potential Transformer for 34.5 KV service.



Outdoor type, OISC complete Metering set for 69 KV containing Current and Potential elements.



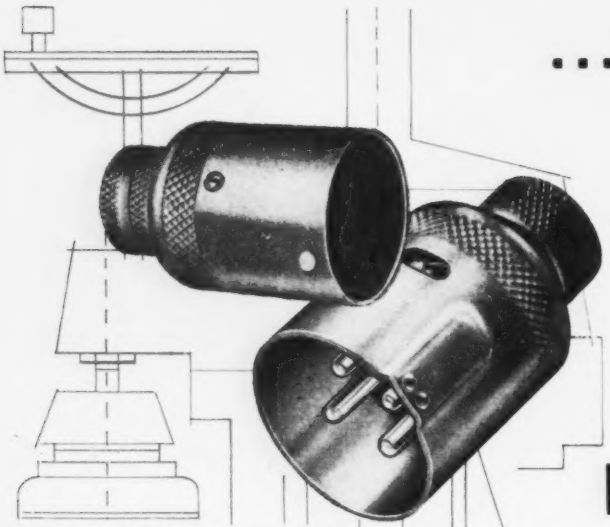
Outdoor type, OISC Current Transformer for 46 KV service.

The Standard Transformer Co.

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

...for Motorized Valves

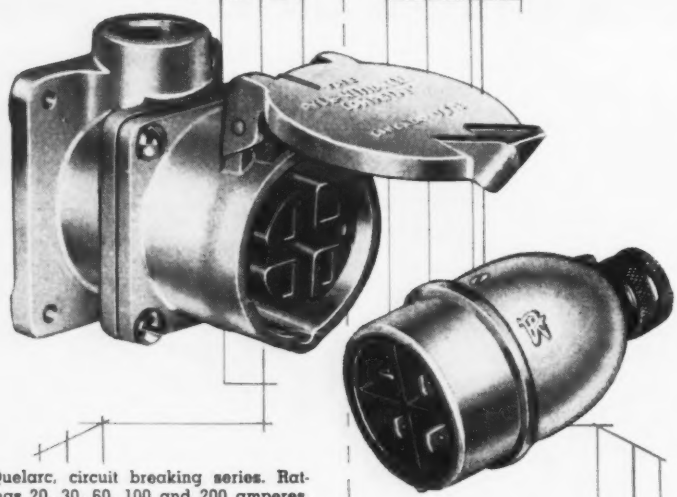


PYLE-NATIONAL

PLUGS and RECEPTACLES

- *Shorten out-of-service time*
- *Assure proper reconnection*
- *Save time and labor*

*Triploc, multi-circuit series. 1, 2, 3, 4, 6, 8, and 12 pole contact units interchangeable and reversible in any single set of housings. Housings of pressed steel with automatic lock or of cast metal threaded for watertight gasket seal. 2, 3 and 4 gang unit types for up to 48 poles also available.



*Quelarc, circuit breaking series. Ratings 20, 30, 60, 100 and 200 amperes, 250 volts d.c., 600 volts a.c. 2, 3, and 4 pole. Threaded cap, plain and hinged spring door housings.

*Trademark Reg. U.S. Pat. Off.

Pyle-National's safe, easy-to-handle heavy-duty plugs and receptacles quickly pay for themselves when used for connecting motorized valves or any other electrical equipment that must ever be relocated or disconnected for inspection or repair.

These prepolarized connectors not only eliminate the labor expense involved in disconnecting individual wires from junction boxes (or breaking soldered connections) and marking wires and terminals, but in addition, cut to a minimum the length of time valuable equipment is kept out of service.

The multiple-pole TRIPLOC series will handle any combination of power and control circuits. The heavy-duty QUELARC series will handle loads up to 200 amperes. Indeed, there is a Pyle connector for every application, including an explosion proof series for hazardous locations. Write for detailed literature.

Sold nationally through electrical distributors

THE PYLE-NATIONAL COMPANY

1385 North Kostner Avenue, Chicago 51, Illinois

BRANCH OFFICES AND AGENTS in principal cities of the United States and Canada
EXPORT DEPARTMENT: International Rail Supply Co., 30 Church St., New York
CANADIAN AGENT: The Holden Co., Ltd., Montreal

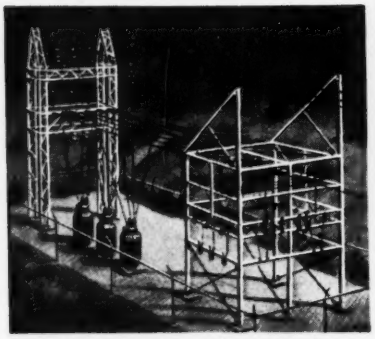
SINCE 1897

CONDUIT FITTINGS • FLOODLIGHTS • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

(Advertisement)

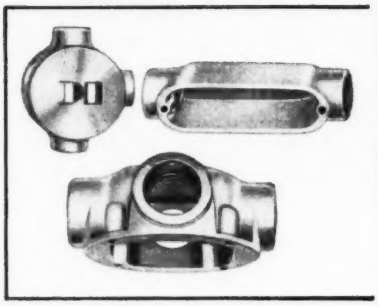
Electrical Applications of Aluminum

Savings in Substations

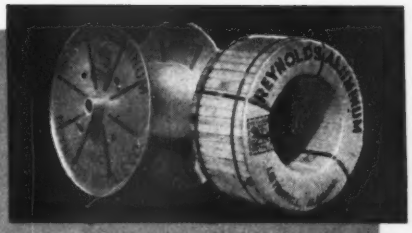


Important savings in erection costs and maintenance are prime reasons for the growing popularity of aluminum substations with utility companies, co-ops and large industrial users. The light weight and easy fabrication of aluminum permits faster, simpler erection. More shop assembled aluminum components mean less assembly at the job site—less skill is needed in assembly and anywhere from 3 to 7 days can be cut in erecting an average substation. No massive foundations are needed, grounding requirements are much simpler and field drilling is easier—more-savings thanks to aluminum. Substation maintenance costs are kept to a minimum because aluminum requires no painting—no costly shut-downs.

Efficient Electrical Fittings and Fixtures



Many thousands of different types, sizes and shapes of die-cast aluminum electrical fittings and fixtures are in wide use today. One important reason for this popularity of aluminum is its weight. Aluminum fittings are light, easy to handle and costs less to ship and deliver to the job... yet are strong enough to withstand shock and strain far beyond actual job requirements. Aluminum is also rustproof and weatherproof and is highly resistant to chemical corrosion. The smooth satin finish inside and out of aluminum fittings protects fingers during installation and protects insulation on wire. Perfect uniformity in die-cast fittings and fixtures is easily obtained which makes installation easier, cuts costs and speeds up work. Write to Reynolds for details on these and any other electrical aluminum applications.



Cut Conductor Handling Costs

WITH REYNOLDS ACSR MASTER REEL and COIL

Want cost reduction proof? Then see how Reynolds Master Reel and Cable save important time, money and labor.

Reynolds all metal Master Reels sharply decrease handling, storage and bookkeeping costs. *Four Master Reels actually take the place of one hundred wooden reels!* They're easily taken apart and re-assembled around the Master Coil by linemen in the field. They're far stronger than wooden reels and can be used over and over again.

Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. They are carefully waterproofed, lagged and banded for complete protection in transit and on the job.

Plan today to convert to the money-saving Reynolds Master Reel and Coil method. Sooner or later you'll use aluminum—why not now? ***Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.***

FREE...ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

For information on specific problems

see your Reynolds distributors listed below or write direct to

Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky

A. A. Electric Supply, Chicago • California Electric Supply, San Francisco • General Electric Supply Co., Bridgeport (and branches) • Hendrie & Bolthoff, Denver • Hughes Electric Supply, Orlando • Maydwell & Hartzell, Inc., San Francisco • San Antonio Machine & Supply Co., San Antonio • Southern Electric Equipment Co., Atlanta Chas. L. Ward Co., Kansas City, Mo. • Westinghouse Electric Supply Co., New York City (and branches) Williamson Sales Co., Shreveport, Dallas and Houston

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

*A **Transistor** of point-contact type. Two hair-thin wires control current flow in germanium metal.*

It's helping to win the Battle of the Watts

*Laboratories engineer examines **Transistor** oscillator. It is used in Englewood, New Jersey, where 10,000 subscribers can personally dial distant cities. **Transistors** generate the signals which carry the dialed numbers to other towns and cities. Other uses are in prospect.*

When you keep down the power needed to send voices by telephone you keep down the special equipment needed to supply that power. A great new power saver for telephony is the ***Transistor***, invented at Bell Telephone Laboratories, and now entering telephone service for the first time.

Tiny, simple and rugged, the ***Transistor*** can do many of the things the vacuum tube can do, but it is not a vacuum tube. It works on an entirely new principle and uses much less power than even the smallest tubes. This will mean smaller and cheaper power equipment, and the use of ***Transistors*** at many points in the telephone system where other equipment has not been able to do the job as economically.

It's another example of how Bell Telephone Laboratories makes basic discoveries, then applies them to improve telephone service while helping to keep its cost down.

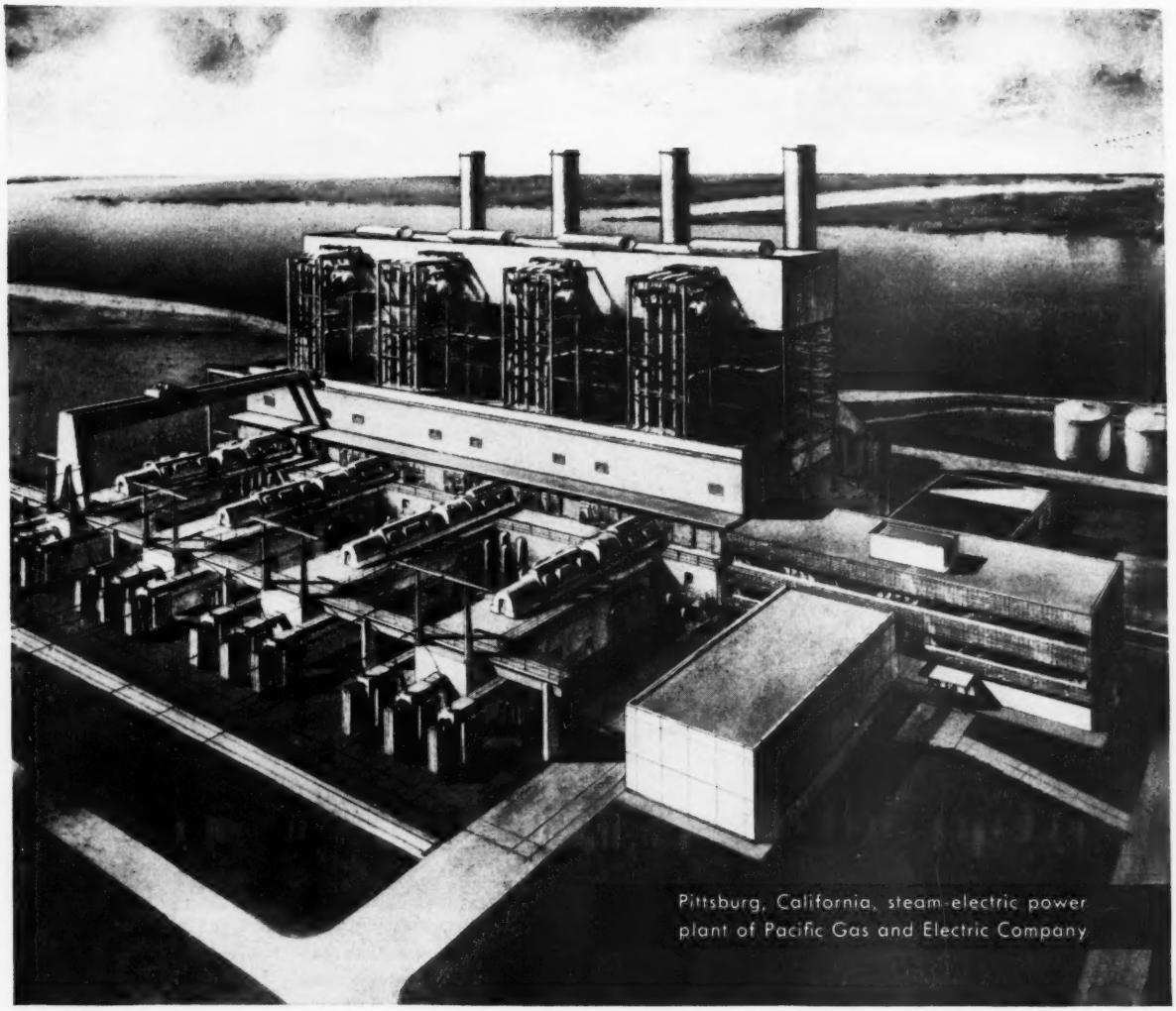
TRANSISTOR FACTS

Created by Bell scientists. First announced in 1948.

Has no glass bulb, requires no filament current or warm-up period. Operates instantly when called upon. Uses no energy when idle.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields.



Pittsburg, California, steam-electric power plant of Pacific Gas and Electric Company

Power Stripped For Action

At 600,000 k.w. Pittsburg will be the largest steam-electric plant in the west. Generators and boilers are outdoor installations.

The design combines economy and efficiency, and provides for future expansion. The result is low initial investment with economical and flexible operation.

Advantages of the complete, integrated Bechtel service—design through construction—are evident in many power plants. An exploratory talk may show that it is the ideal way to build your next project.

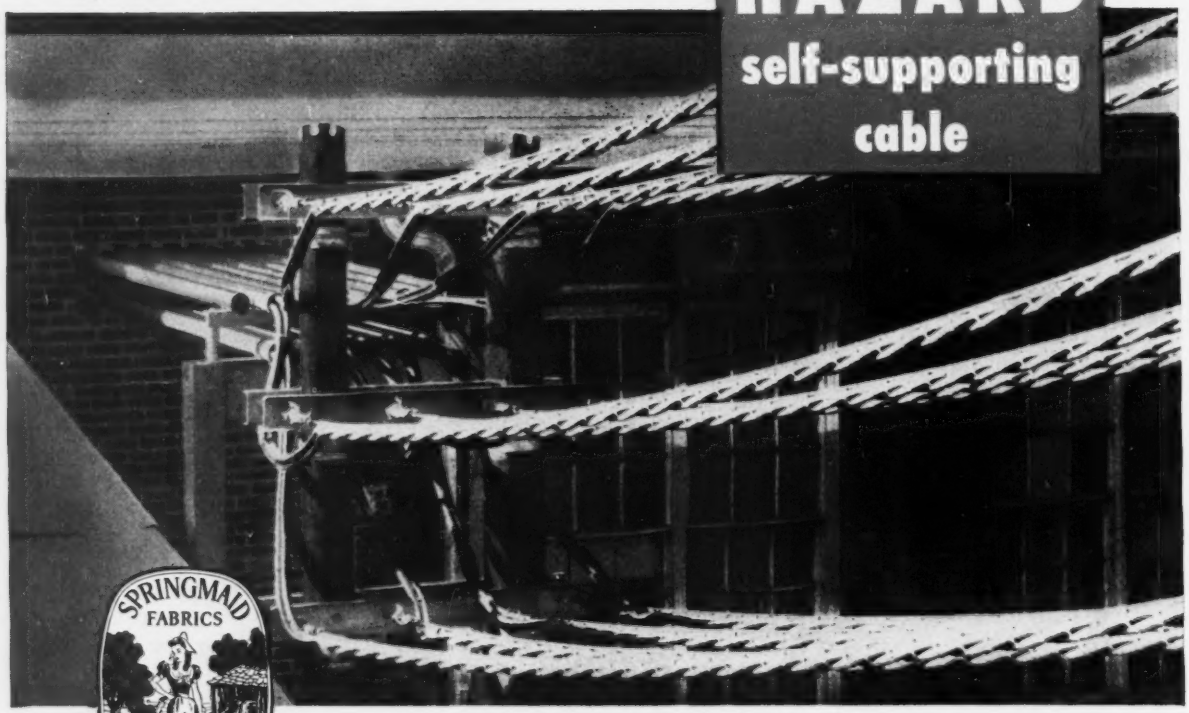
BECHTEL CORPORATION

BUILDERS FOR INDUSTRY

Los Angeles • **SAN FRANCISCO** • *New York*

abreast of the trend in industrial power transmission

...SPRINGS MILLS selects HAZARD self-supporting cable



From main substation, Hazard self-supporting cables distribute power to the main buildings of Springs Mills plant. Note the neatness and compactness of the installation. Cables are readily accessible for splicing; all-in-one construction makes relocation easy.

SPRINGS Cotton Mills, among the most modern in the textile industry and home of famous Springmaid fabrics, demand the finest when it comes to industrial power transmission. Safety, compactness, ease of installation, appearance and low cost were uppermost considerations in the selection of Hazard self-supporting cable for power distribution at the Springs Plant.

Hazard self-supporting cable is insulated with Watertite heat- and moisture-resistant insulation and protected by Hazard's rugged Hazaprene ZBF sheath. This abrasion-resistant jacket stands up against the destructive conditions common to industrial installations and, in addition, more than meets the requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines for flame resistance.

Every year, more and more Hazard self-supporting cable is used industrially for safe transmission of large blocks of power in limited spaces and narrow clearances, providing power distribution that is neat and compact and can be relocated with a minimum of effort. Today, investigate the advantages of the "all-in-one" construction (preassembled cable, messenger and binder) of Hazard self-supporting power cable for your particular operation. See your Hazard representative or write . . . Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZARD *insulated cables*

1454

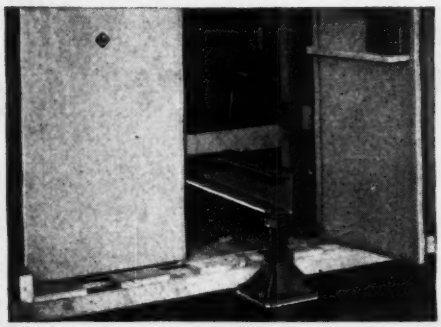
ALLIS-CHALMERS

METAL-CLAD Switchgear

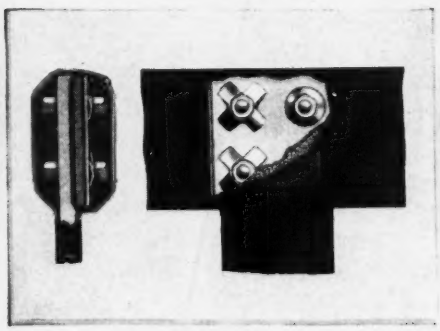
4 REASONS

Why It's EASY TO INSTALL

1 PLACING switchgear over floor cable is done without lifting cubicles because A-C engineers designed the cubicle so that it simply slides into place.



2 MOVING is an easy job even if there's no crane or overhead space. Installation-wise A-C engineers built in provision for jacking all indoor switchgear units.



3 JOINING buses need no longer be a long, time-consuming job. Joint is bolted; then, no-corona tape is placed over bolt heads and nuts. Next, a molded Neoprene boot is slipped over the joint and taped in place. No fuss, no muss, no liquid compounds to worry about.

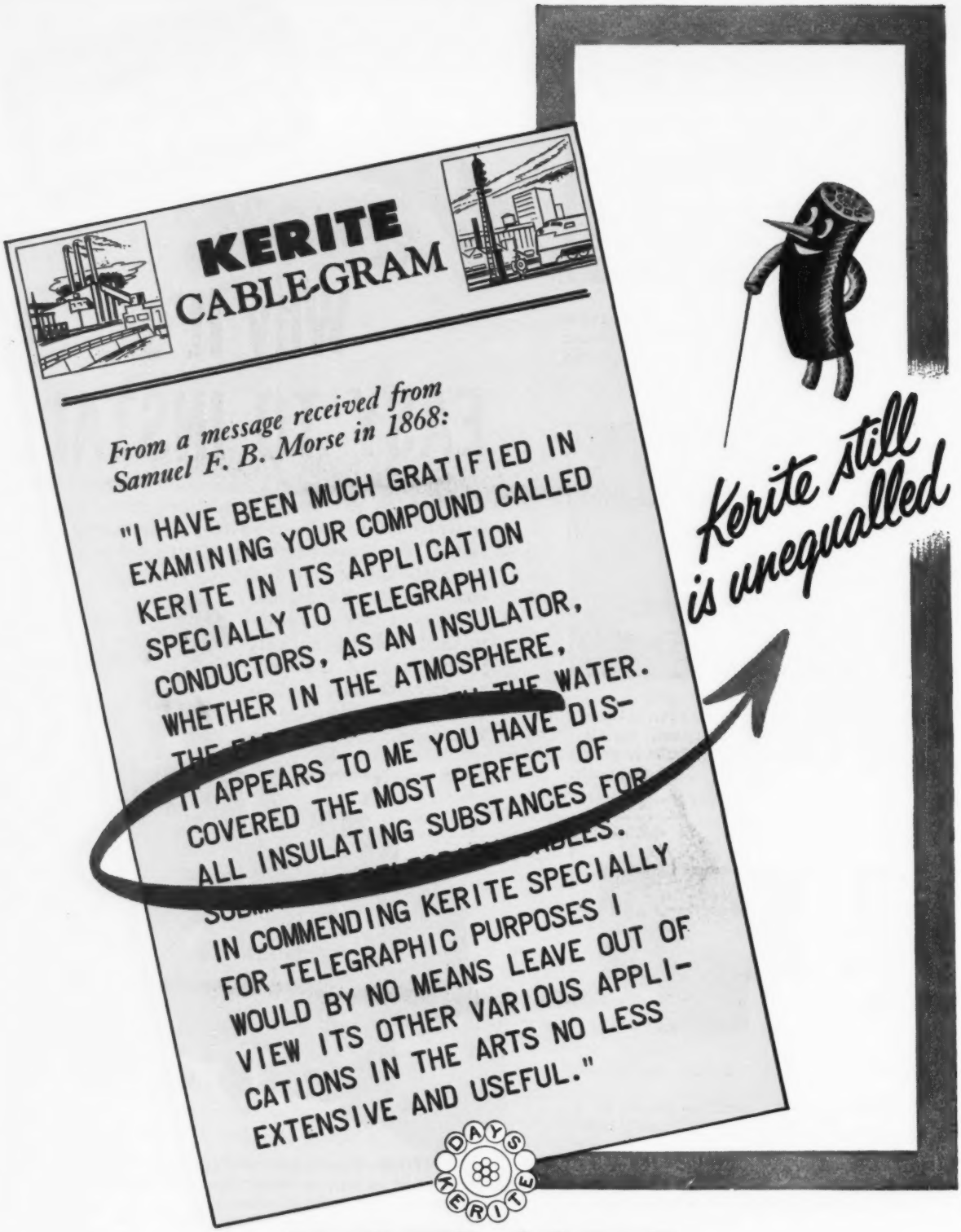
EACH of the accompanying pictures shows one way in which Allis-Chalmers switchgear simplifies installation. These and other carefully engineered details cut installation time and cost. For more information about this economy-minded switchgear, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

4 INSPECTING contacts and arc chute during and after installation is only a three minute job with latest Allis-Chalmers circuit breaker. Only one nut to take off and all barriers can be lifted right out.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-3950


KERITE
CABLE-GRAM
From a message received from
Samuel F. B. Morse in 1868:
"I HAVE BEEN MUCH GRATIFIED IN
EXAMINING YOUR COMPOUND CALLED
KERITE IN ITS APPLICATION
SPECIALLY TO TELEGRAPHIC
CONDUCTORS, AS AN INSULATOR,
WHETHER IN THE ATMOSPHERE,
IT APPEARS TO ME YOU HAVE DIS-
COVERED THE MOST PERFECT OF
ALL INSULATING SUBSTANCES FOR
IN COMMENDING KERITE SPECIALLY
FOR TELEGRAPHIC PURPOSES I
WOULD BY NO MEANS LEAVE OUT OF
VIEW ITS OTHER VARIOUS APPLI-
CATIONS IN THE ARTS NO LESS
EXTENSIVE AND USEFUL."
Kerite still
is unequalled
TODAYS KERITE

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.

THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER
THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.

Hoover Offers a Federal Power Policy

For over a decade the electric utility industry and many fair-minded Americans who resent the government's unfair competition with private enterprise have been seeking a way to halt the encroaching socialization of the industry.

At Case Institute on April 11 former President Herbert Hoover pointed the way in an address (See p 104) which might well be taken as the basis for a new federal power policy. Drawing on his vast experience in governmental affairs and applying the sound logic which has won for him the respect of all thinking Americans, the elder statesman, who said that "I do not believe in criticism without remedies," laid down this program for "de-empiring" the existing federal power empire:

1. Congress should cease to make appropriations for more steam plants or hydroelectric plants solely for power. If they are justified, private enterprise will build them and pay taxes on them.

2. Congress should follow the precedent of the Colorado (Hoover) project and make no more appropriations for new multi-purpose projects unless the electric power is first leased on terms to be described later.

3. Congress should, jointly with the President, set up a temporary commission on reorganization of this whole federal venture with resources to employ technical assistance.

One of the duties of this commission would be "to formulate the methods and standard terms for leasing generating plants, transmission lines, and the electric energy to private enterprise or to municipalities or to the states or to regional authorities that may be set up and managed by the states. These standard terms should provide for payment of interest and amortization of the federal investment, the refunding of arrears in these items and also some contribution in lieu of taxes. The latter would not need apply in case of private enterprises as they pay their own taxes."

Another duty of the commission would be to "develop methods by which non-federal agencies can share cooperatively in the cost of future capital outlays on the electrical part of multiple-purpose dams."

In most respects this program seems both sound and reasonable. Those in the industry who have been seeking a way to a sound federal power policy should examine these proposals very carefully. They seem to be the best solution presented to date.

11 Years of Fatal Accidents in the Electric Utility Industry

1941 to 1951 Inclusive

(From EEI Accident Prevention Committee Summaries)

Year	Total	El. Shock or Burn	Falls	Motor Vehicles	Struck by	Burned	Caught in	Drowned	Misc.
1941	121	90	11	8	4	2	3	1	2
1942	121	81	19	11	6	3	0	0	1
1943	117	81	14	3	7	5	1	3	3
1944	82	62	6	5	6	1	2	0	0
1945	116	79	14	6	5	4	3	3	2
1946	105	68	19	8	5	0	2	2	1
1947	173	125	20	8	13	3	2	1	1
1948	149	102	21	13	6	2	2	0	3
1949	176	134	16	13	6	1	5	1	0
1950	141	102	13	9	4	4	0	5	4
1951	165	121	21	8	4	4	1	5	1
Total	**1,466**	**1,045**	**174**	**92**	**66**	**29**	**21**	**21**	**18**

Eternal Vigilance Is the Price of Life

The table above showing that in 11 years 1,466 workers in the industry lost their lives seems to indicate only one thing—Someone must die each year so that the public may have electric service. Over the years there has been little change in the number of deaths, nor has there been any noticeable change in their cause.

This sad list is not an indictment of the industry or any part of it. Management has done its best to provide protective equipment for the men on the job. Safety instruction never ceases. Recognition, awards, and other incentives are usually given to employee groups with safe working records. As for the employees they're all for safety. The lives that are lost are their own. Yet year after year from 120 to 170 men are killed on the job.

How these accidents could have been avoided has been explained for years. Management and employees know how to avoid them. But still they will be repeated year after year. Even the most skilled and the most careful worker will occasionally make a mistake. And in this industry the first mistake is often fatal. At all times management and worker alike must remember that eternal vigilance is the price of life.

It Is—It Isn't—a Heat Pump

When is a heat pump not a heat pump? This is not a riddle. It is a serious question.

From the time of Lord Kelvin, nearly a hundred years ago, the heat pump has been used for cooling and refrigeration. Then, soon after the first World War, reports of development of the machine for heating applications, and referring to it as a heat pump, began to appear in engineering literature. Thus it was that the term, which actually means any device for the removal of heat from one solid, liquid, or gas to another, was narrowed down to designate a machine designed specifically for heating. Although room air conditioners and the mechanisms of electric refrigerators are heat pumps, they are not referred to as such. But when a machine is used for heating alone or for heating and cooling it becomes a heat pump.

The question, "When is a heat pump not a heat pump?" arises from publication in Electrical World, Dec 8, 1952 of an item saying that Frigidaire would offer a heat pump in 1953. The item was condensation of a release on room air conditioners which stated that this General Motors division "next year will have year-around combination heating and cooling units." Then came a letter saying that Frigidaire has no plans to bring out a heat pump. The units announced will combine combustion heating and mechanical cooling.

As yet, the term "heat pump" has been applied only to that machine that takes the place of the conventional combustion furnace. But when the room air cooler reverses itself to supply heat, will it be a heat pump?

"When is a heat pump not a heat pump?" is a question that deserves attention. It presents a problem in nomenclature that should be solved if confusion is not to become worse confounded as the art progresses. As a specific suggestion, might not the term, "heat pump," be left in its correct and generic meaning of a machine for heating or cooling or both, and its various forms be designated according to their particular applications? The term, "room air conditioner," is a case in point. Why not say "electric air conditioner" to designate the machine now called a heat pump? Has anyone any better idea?

Ain't It the Truth!

"One reason why the co-ops have got into the public power camp is that public power is, generally speaking, cheap power, and co-ops are eternally looking for cheap power. Another reason has been that both Public Power and Electric Co-operatives were lonely, and it was mating season. And you know how those things are—all of a sudden, bingo!"

This sage observation comes from the "Co-op Power News" of the Hancock-Wood Electric Cooperative. Our only comment, in good old country fashion, is "Ain't it the truth!"

THE ELECTRICAL WEEK

The Issue's News Highlights—Herbert Hoover offers a plan to get federal government out of the power business.

AEC is ready to present Congress with proposals for revising McMahon Act to increase industry participation in atomic developments . . . Nation's first industrial atomic group, Atomic Industrial Forum, Inc, is founded.

Eisenhower names Jerome K. Kuykendall to FPC and Ralph H. Demmler to SEC.

Infrared lamp range top cooking unit is on the market. Electrical folks remember splurge given to it in "Life" magazine about two years ago. Sears Roebuck & Co is taking entire present output from Sylvania Electric Products. Sylvania hopes to step up production of the unit for use by other range manufacturers.

Heavy morning load and low water on Upper Columbia forced curtailment of 150,000 kw to aluminum and electro-chemical customers last week. Unprecedented shortage is expected to be temporary, confined to morning peaks. Pending arrival of spring freshet, about 20% interruptible load is being carried by low-cost steam.

Dr W. A. Dittmer, BPA power manager, will move to Kaiser Aluminum & Chemical Co as power manager in Spokane to head company's aluminum power program throughout U. S., Canada, Alaska, and South America. No successor has been named.

It is rumored that GOP is considering Elmer Lindseth, president of Cleveland Electric Illuminating, as its nominee for mayor of Cleveland.

Connecticut River power retains Ebasco Services as construction manager, and Charles T. Main, Inc, Boston, as designing engineers together with New England Power Service to build $50-million, 150,000-kw Littleton, N. H., hydro plant on Connecticut River.

City of Cuyahoga Falls, Ohio, which has had a two-month billing system for past year, will return to one-month basis. "Most of power consumers seem to prefer getting bills every month," Mayor Harding Wichert says.

Iowa Electric Co and Iowa Electric L&P were merged effective April 8. Stockholders of each company in separate meetings voted the merger on April 7.

A joint public hearing on a merger of Puget Sound P&L with Washington Water Power may be arranged by FPC, Idaho PSC and Washington State PSC, according to Jerome K. Kuykendall, chairman of Washington PSC.

Public service of New Mexico asks PSC approval to increase electric and water rates by $1.2 million annually . . . Concord Electric Co gets New Hampshire PSC approval to increase rates $61,500 a year. The increase covers residential and other services and amounts to a reimbursement or "make-whole" allowance to offset the higher cost of bulk power purchased by the company.

Off the Washington Wire—New York's bid to build the U. S. portion of St. Lawrence power project is in line with President Eisenhower's position on this development. Republican Sen Alexander Wiley put the President's view on record in a statement calling for FPC to "stop stalling" in making a decision on the N. Y. application . . . Depa is discontinuing the use of forms DEPA-1, 8 and 25 as another step toward liquidating its control activities. These forms have been used by utilities to secure allotments of materials and equipment and for reporting inventories.

Senate has confirmed the appointment of Ancher Nelsen to be REA administrator . . . W. J. Burke, Bureau of Reclamation regional counsel at Billings, Mont., has been called to Washington to be a special assistant to Interior Department Solicitor Clarence Davis. Burke will probably have a hand in conducting the legal studies on which power policy changes are to be based.

Interior Secretary Douglas McKay last week told a Senate subcommittee "the people should have the final say" as to whether power should be developed and distributed by private or government means.

Water storage in Bureau of Reclamation reservoirs in northern half of Missouri River Basin is about average for this time of year, bureau reports . . . FPC permits Agriculture Department to withdraw its petition to intervene in proceedings on application of Idaho Power's proposed Oxbow project. Petition had been filed by the former Truman administration.

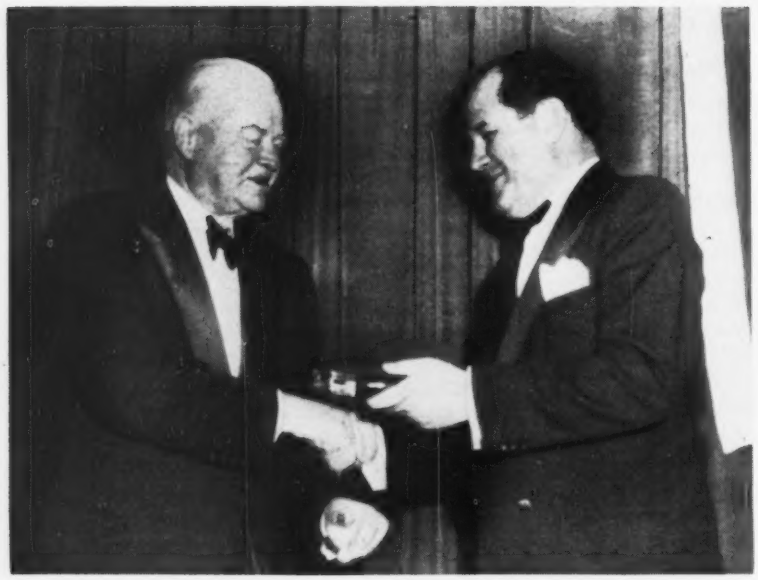
Wholesale rate committee of Northwest Public Power Association will ask BPA to increase its rates to direct-sale industrial customers by at least 15% over rates charged to utilities which distribute at retail. Public group feels BPA's present uniform rate to all customers is "unfair competition." Proposal is among others which will be made in connection with increased rates planned by BPA for December, 1954 . . . Another proposal is that BPA give distributing utilities credit on their computed demand, or otherwise, for diversity they create in Northwest Power Pool. It is estimated about 600,000 kw of generation is created by load diversity of pool members. Between 40 and 50% of this capacity would be affected by the proposal.

Virginia E&P and IBEW, AFL, agree to 8% wage increase, retroactive to April 1 when the previous pact expired.

Congratulations—Combustion Engineering, Inc (formerly Combustion Engineering-Superheater, Inc) elects M. H. Isenberg president, succeeding J. V. Santry who is named chairman. S. G. Allen, former chairman, will continue as executive committee chairman . . . Sangamo Electric elects C. L. Clark vice president, secretary-treasurer.

Army Corps of Engineers announces these new district engineers: Col Lavonne Cox, Tullahoma, Tenn., Col H. Hille, Jr, Garrison, N. D., Col Nelson Le Clair, Rock Island, Ill., and Col W. D. Milne, Louisville, Ky.

Hoover Plan—Dams But No Socialism



HERBERT HOOVER receives citation from Case Institute of Technology at school's diamond jubilee program. The ex-President was featured speaker. Dr. T. Keith Glennan, Case president, presents award. Hoover was cited as "engineer-extraordinary and inspiring example"

Herbert Hoover recently urged the federal government to "get out of the business of generating and distributing power" as soon as possible and proposed three steps by which this could be accomplished.

The former President spoke before the Diamond Jubilee Convocation at Case Institute of Technology April 11.

The Hoover Plan

The three proposals he made to end what he termed "creeping socialism" in the electric power field were:

- Congress should stop making appropriations for more steam plants or hydroelectric plants solely for power.
- Congress should follow the precedent of the Colorado project (Hoover Dam) and make no more appropriations for new multipurpose projects unless the electric power is first leased for distribution to private companies or to state, municipal, or regional bodies set up by the states.
- Congress should set up a commission to reorganize "the whole federal venture" in the power field.

Hoover predicted the federal government could reduce its annual spending for power by $600 million a year if his plan were adopted.

In connection with the third proposal, the former chief executive would give the commission power to revise accounting procedures used in multipurpose dam projects to divide costs fairly among the separate functions; investigate actual cost and probable returns from federal projects; set methods and standards for leasing generating plants, transmission lines, and electric energy to cover interest payments, amortization, and arrears on federal investment; and develop procedures for local or state agencies to share cooperatively in cost of future capital outlays for generating facilities connected with multipurpose dams.

Fears 'Creeping Socialism'

In tracing the growth of federal invasion of the power field, Hoover noted that 20 years ago federal plants had a capacity of 300,000 hp or about $\frac{2}{3}$ of 1% of all generating capacity. By the middle of this year, he continued, the government's generating capacity will be 15 million hp or 12% of all generating capacity. If plants now under construction or authorized by the federal government are taken into consideration, he added, this figure jumps to 37 million hp or 20-25% of all capacity.

In condemning the federal government's ventures in development of electric power, the ex-President did not turn thumbs down on multipurpose dams. In fact, he said, he is in favor of them.

"We needed these dams," Hoover declared. "And we need more of them . . . Let no one misinterpret my view on water conservation. I have been for thirty years an ardent exponent of multipurpose dams."

But, he said, socialistic abuses connected with their construction and operation which have encroached upon private industry, must be eliminated.

"The first step toward socialization was taken," said Hoover, "when the federal government undertook itself to generate and distribute this electric power from multipurpose dams, and now the federal government has taken further socialistic leaps by building steam and hydro plants solely for the generation of electric power."

Hoover said the government abused its power by duplicating transmission lines, prohibiting private companies from developing certain hydro sites so government agencies could develop them, and exempting federal projects from taxes while tax money paid by private utilities goes toward paying for such projects.

In connection with taxes, Hoover noted that private companies paid over $750 million in federal taxes during last fiscal year and nearly $470 million in state and local taxes. This compares with less than $5 million paid by federal power projects toward state and local taxes.

Project Costs

In his criticism of federal power operations Hoover asserted that in many cases cost of constructing power projects "has been woefully underestimated." He admitted that some of the increase was due to rising prices but added "some of this underestimation is possibly due to presenting Congress with a modest project and then hugely edging it up." He pointed out that another variety of underestimation was justification of projects to Congress on the basis of certain rates and subsequent sale of power from the project at lower rates.

The former chief executive charged that New Deal promises to Congress that the power projects would pay

3% interest and be amortized over 50 years were not always fulfilled or not honestly fulfilled. He cited certain accounting procedures where interest and amortization of the federal power investment could be charged off to navigation, flood control, or irrigation. Hoover added that an investigation conducted by a leading accounting firm showed that some federal projects never would be able to make such returns as promised to Congress.

This program of subsidized power benefits a minority of the people but is paid for by heavy tax burdens on all the taxpayers, Hoover said.

"If the price of power from federal enterprise were placed at a level which would include tax equivalents and all other non-included costs, their rates generally would be equal to, and in some cases higher than, the rates of neighboring private utilities," the former President declared.

Leasing power facilities directly to private companies or local agencies would not leave the consumer unprotected, he said, because of the regulatory power over rates of state and federal commissions.

California Utility Ordered to Answer IBEW Charges

National Labor Relations Board April 10 ordered Southern California Edison Co to answer an International Brotherhood of Electrical Workers complaint charging the company with unfair labor practices during the strike which began March 10.

The union charges Edison with coercion of employees and refusal to bargain in good faith.

There have been no direct company-union talks since the strike began.

An Edison statement issued after the NLRB directive said "the company is happy to have an examination of the fairness and propriety of the conduct of all the parties involved."

The complaint charges the company with threatening strikers and offering inducements for those who return to work. It charges that a pay raise granted non-striking members of the IBEW bargaining unit April 8 was illegal. The increase had been turned down by the union as inadequate during pre-strike negotiations. Edison announced that the raise—5% or $15 a month, whichever is greater—was being given to those who had stayed on the job and those returning.

Kuykendall Appointed to FPC

Eisenhower also names Ralph Demmler to SEC. Chairmanships on the two commissions still are vacant

President Eisenhower last week named two new men for positions on commissions which regulate electric utilities.

Jerome K. Kuykendall of Olympia, Wash., is to replace Thomas C. Buchanan as a member of the Federal Power Commission. The commissioner-designate is chairman of the three-man Washington State Public Service Commission and a former state assistant attorney general. His state commission term runs until 1955, which means he will have to give up that position when he takes over at FPC.

Ralph H. Demmler, Pittsburgh attorney, is to fill the vacancy on the Securities and Exchange Commission created by the resignation of J. Howard Rossbach. The Pittsburgh man is a partner in the law firm of Reed, Smith, Shaw & McClay and a specialist in corporation banking law.

Chairmen Not Chosen . . . The White House may designate these two men to be chairman of their respective commissions, or he may choose commission heads from other members of the two groups. It is not expected that the chairmen will be named until Demmler and Kuykendall have been confirmed by the Senate.

Born in Pomeroy Wash., Dec. 8, 1907, Kuykendall moved to Olympia soon after his father was appointed to the Washington PSC. Young Kuykendall attended high school in Olympia and received his law degree from the University of Washington in 1932.

He practiced law in Olympia until 1941 when he was appointed state assistant attorney general. He received a naval commission during World War II and spent several years in military service.

Served on PSC . . . Kuykendall was appointed to the Washington PSC Jan. 1, 1951 for a term of four years. He has also served as counsel for several state legislative committees. He is currently chairman of the state commission—the same position formerly held by his father.

His state commission work has dealt with all public utilities, and regulation of electric utilities has not loomed large among the commission's duties. Because a large portion of the state's electric utilities are publicly owned, they are not subject to regulation.

But Kuykendall is thoroughly familiar with general utility operations and has presided over several rate cases. He is also familiar with the many issues involved in the public-private power controversy since his home state has been the battleground for many of the battles on power.

Previous to his appointment to FPC, the Washington man had been under consideration for possible appointment to the Federal Communications Commission.

Views Not Known . . . One of the first problems that Kuykendall may face at FPC is treatment or rapid tax amortization for rate-making and accounting purposes. He was not inclined last week to discuss his stand on this subject. FPC hearings on rapid amortization were conducted last month, but a decision is pending. (EW, March 30, p 7.)

However, Kuykendall is a member of the executive committee of National Association of Railroad and Utility Commissioners which has advocated that the rapid amortization be treated in the same way that electric companies have proposed.

Hearings had not been set last week by the Senate on confirmation of Kuykendall and Demmler.

Pelton Dam Bill Tabled

A bill supported by Portland General Electric Co which would have allowed court appeals from rulings of the state hydroelectric commission was tabled by the House State and Federal Affairs Committee early this month. The controversial bill—known as the Pelton Dam bill because it aimed at gaining state permission for PGE to proceed with its Pelton Dam project—previously had been rejected by the House and then brought to life again when the same body voted to reconsider it.

AEC Clearing Way for Atomic Industry

● Commission draws up recommendations for revision of McMahon Act permitting private firms to own and operate nuclear plants

● AEC proposals have backing of President, National Security Council and need only the sanction of Congress

Government has taken its first serious step toward establishment of an atomic power industry.

The Atomic Energy Commission has drawn up formal recommendations for changes in the Atomic Energy (McMahon) Act of 1946. The changes would permit utilities and other private firms to own and operate atomic plants to produce electric power. AEC's proposals have been approved by President Eisenhower and the National Security Council, and now require only the okay of Congress.

Easier Industry Participation . . . The AEC recommendations, which were requested last winter by the Joint Congressional Committee on Atomic Energy, are aimed generally at making easier industry participation in all nonmilitary phases of atomic development. But their major objective is to make possible private development and ownership of atomic power plants.

The recommendations have not yet been made public. They will not be until members of the Joint Congressional Committee have a chance to study them. That probably will come in a week or so, when the committee starts hearings.

Present Barriers . . . But the most important legal barriers to private activity in atomic power long have been well known. They are the McMahon Act's provisions which:

- Forbid private ownership of fissionable materials or facilities (reactors) to make them;
- Prevent the issuance of unlimited patents for industrial discoveries and developments in atomic energy;
- Shroud the atomic program, almost in its entirety, in secrecy.

Here's how AEC proposes to amend these restrictions.

First, the commission wants to be able to issue licenses to industrial firms or any other qualified organization to own fissionable materials. This would permit a company to obtain the initial charge of uranium required to start operating a reactor. It also would permit the firm to produce plutonium or uranium 233.

Of course, a private firm could decide to build a so-called straight power reactor—one which would produce no new fissionable material. But present cost estimates indicate that such a machine would have little prospect of proving economic for commercial power service. Industrial firms most interested in atomic plants have shown a preference for one of two other types. One of these is the so-called breeder, which would produce as much, or more, fissionable material as it burned up. The other preferred type is the plutonium producer.

Would Pass on Applications . . . AEC also proposes to license qualified persons to build reactors. The commission wants to pass on the qualifications of each applicant itself. This position neatly averts long-standing public vs private power feud. AEC will listen to any applicant who can produce the financing and the technical know-how to build a reactor.

Another related AEC recommendation is to permit the commission to enter into long-term contracts to sell and buy fissionable materials. This would assure the builder of a commercial reactor of a supply of fuel. Just as important, it would guarantee him a market for any materials he produced.

Patent Arbiter . . . AEC wants to remain the arbiter on patents. Naturally, it would issue none for weapons development. It is willing to license those that are available from private research on strictly commercial work. But even in this field, AEC wants to decide whether a patent should be granted without strings or with the provision that the holder must let other companies use it.

Don't look for any quick revision of the McMahon Act by Congress. AEC's proposed amendments, though limited in number, require almost a complete turnaround on the part of Congress, which has been concerned to date almost exclusively with bombs, atomwise. Congress now will want to look again at the bomb-production program and evaluate the impact on it of a new, private atomic program. Then, it will want to hear from industry men interested in atomic power. The hearings may last all summer

Atomic Industry Forum Formed

The nation's first industrial atomic energy association came into being last week with the filing of incorporation papers in New York for Atomic Industrial Forum, Inc.

Guiding spirit behind the new association is Walker L. Cisler, president of Detroit Edison Co, which with Dow Chemical Co is well into the design phase of an atomic power plant that will be integrated into the power company's system.

The association as envisioned by its founders would perform many of the same functions for the infant atomic industry as Edison Electric Institute does for the electric industry. Presidents and atomic energy executives of 13 corporations and educational institutions have been named to the Forum's board of directors.

At a press conference in New York, the directors pointed out that development of an atomic industry by private businesses was at present prohibited by the Atomic Energy (McMahon) Act of 1946. The act prevents private business from owning fissionable material in necessary quantities and from manufacturing fission products.

But the Atomic Energy Commission has proposed changes in the act that would clear away these barriers and allow industry to develop commercial aspects of nuclear power. Hearings on the act are scheduled to begin shortly (See story this page).

Asked whether the organization

would attempt to influence legislation on the act, Cisler said:

"The Forum will not take an active interest in changing the law. That must naturally come from other sources. This is not a lobbying group —it will have no lobbying activities. It is a forum for advancing the understanding of atomic energy."

Purpose of the organization is fourfold, according to its certificate of incorporation:

- To encourage development and use of atomic energy in accordance with the best traditions of American democracy and free competitive enterprise.
- To provide a forum where individuals and organizations may consult and cooperate in resolving atomic energy problems of concern to the nation, industry, or the public.
- To disseminate to the extent consistent with security knowledge relating to development and use of atomic energy.
- To foster and encourage research and development relating to atomic energy.

The Forum got its start from a suggestion made last November by Dr. T. Keith Glennon, president of Case Institute of Technology in Cleveland and former member of the Atomic Eenergy Commission.

An association of businessmen, engineers, scientists, educators could provide a forum, Glennon said, "in which industry might develop its best thinking in the interest of the advancement of the peacetime uses of atomic energy; a forum in which industry might develop an informed voice to be heard at governmental levels as new atomic energy policy is hammered out; a forum, not to serve the narrow interests of the few, but to stimulate the indusrial development of atomic energy for the good of all."

Cisler soon began discussions with presidents of 40 companies engaged in atomic energy work, as well as with scientists and educators. In meetings of businessmen in December and February, he found most of them believed an association of business interests should be set up. Incorporation papers were drawn up an AIF came into being.

The plan, Cisler said, is to hire a full-time executive director and a staff to handle technical, legal, economic and managerial problems involved in commercial development of the atom.

In addition to Cisler and Glennon, the forum's board of directors includes:

Albert L. Baker, chairman, Vitro Corp and Vitro Manufacturing Co; John L. Collyer, president, B. F. Goodrich Co; Dr Frederick L. Hovde, president, Purdue University; Alfred Iddles, president, Babcox & Wilcox Co; Joseph A. Martino, president, National Lead Co; John R. Menke, president, Nuclear Development Associates.

Also, Adm Earle W. Mills, president, Foster-Wheeler Corp; Dr Mark E. Putnam, executive vice president, Dow Chemical Co; Ross W. Thomas, Phillips Petroleum Co; Howard G. Vesper, vice president, Standard Oil Co of California; and J. B. Woodward Jr, president, Newport News Shipbuilding and Drydock Co.

Headquarters of AIF, Inc, will be the Engineering Societies Building, 29 W. 39th Street, New York, N. Y.

How Soon?

The first commercial atomic power plant may be on the line within two to five years, according to Albert L. Baker, Vitro Corp chairman and a director of AIF Inc. "The first plant can't be economical, because of safety factors that will have to be built into it," he said. "But we should get the plant down within commercial price range within ten years."

Providing Cheaper Power for Lisbon

Recently completed Castelo do Bode Dam (above) near Lisbon, is part of Portugal's 20-year hydroelectric development program. The program was started in 1935.

Electricity produced at Castelo do Bode Dam largely replaces that previously produced by thermo-electric plants, using imported coal. Power rates in Lisbon have been cut about 30% since the hydro project went on the line.

Bushing Failure Causes Toledo Edison Outage

Failure of a bushing on a 69-kv oil circuit breaker is believed to have been the cause of a system-wide outage suffered by Toledo Edison Co on April 6. The failure, occurring at 6 a.m. at the company's Acme Station, caused a short circuit entirely external to the breaker case.

Toledo Edison's 2,500-sq mile service area with its 169,500 customers was blacked out for periods varying up to 5½ hours.

A few minutes after the bushing failure, the company received power from Ohio Edison Co and Ohio Power Co but increased power demand made it necessary for the Acme control room operator to dump Toledo Edison's entire load to prevent further damage.

Restoration of operations at Acme Station was hampered by burned out carrier communications, lighting and metering circuit in the plant and at interconnection points. By 6:45 Toledo Edison again was receiving power from Ohio Edison and Ohio Power and later some of its stand-by equipment was put on the line. The Toledo utility eventually took 81,000 kw from Ohio Power and 22,000 kw from Ohio Edison. Acme Station itself required 16,000 kw to start up again and the rest of the power was used for high priority loads.

Eunice P. Bruyn, Connecticut Light & Power Co; Margaret Schneider, Wheeling Electric Co; Jan Reynolds, Sylvania Electric Products Co; Mary Turner, Potomac Electric Power Co

Helen Kirkland, Hotpoint; Elizabeth Williams, Monongahela Power Co; Elizabeth Parker, Georgia Power Co; Edith Hitchcock, Alabama Power Co, just out of the Home Service Conference

Sell—and Sell—and Sell

Put More Power in Selling, Utilities Told

More selling and better selling in residential, farm, commercial, and industrial service fields are urged in section meetings of recent sales conference of Edison Electric Institute

Home Service Conference

"The Widening Field of Home Lighting" and "Demonstration Ideas that Build Load" were major topics discussed at the EEI home service conference. Participating in the former were Avis R. Broadhurst, West Penn Power Co; Edna Stephany, Pennsylvania Power & Light Co; and E. J. Hurley, Detroit Edison Co.

Mrs Broadhurst detailed the 1952 program of West Penn's Electric Home Bureau, which included assisting builders in planning 13 exhibit homes, seven of which were "light conditioned."

To publicize the houses in ways that the builder cannot, the utility:

Provides an advertising and publicity plan in consultation with the builder.

Furnishes flood lights and free electric service.

Prepares wiring and lighting layouts.

Recommends type and placement of electric kitchen and laundry equipment.

Contributes financially to an advertising fund.

A total of 42,000 people visited the seven display homes, at a cost to West Penn of 3.2¢ per visitor. Colored photographs of each house are used in lighting lectures to high school home economics classes, women's groups, and adult homemaking classes.

With a Difference . . . The light conditioned home idea is carried one step further by Pennsylvania Power & Light, according to Miss Stephany. During the past year and a half PP&L had 12 light conditioned home exhibits, which were visited by 44,688 potential customers for modern lighting equipment.

Effectiveness of these homes is limited, however, because the houses are open for so short a time that many people who would like to see them are unable to do so. To perpetuate this type of education display PP&L has installed a Home Lighting Center on its sales floor, where customers may come and see what is new in home lighting.

The Center is "L" shaped, and set up to represent lighting applications in a typical home. Forming an angle with this exhibit is an Electric Center where lamps are sold. Also adjoining it is a display of Certified lamps as well as several exhibits of packaged valance lighting units.

Best use for the Home Lighting Center, Miss Stephany claimed, is for evening group presentations to clubs and organizations such as PTA's, vocational farmers, and senior extension clubs. At these meetings a lighting talk is followed by showing of the film, "Bright Future," and a tour of the facilities.

Demonstration Ideas . . . Participating in the demonstration ideas discussion were Helen Kirtland, Hotpoint Institute; Verna L. Miller, Frigidaire; and Karen Fladoes, Nash-Kelvinator Corp.

Miss Kirtland listed eight techniques that can be employed to demonstrate to women's groups that the electric water heater is convenient, safe, cool, clean, dependable, economical, automatic, and modern. These include props (like charts and scale models), gimmicks, stores, cartoons, skits, poems, contests, and tying in its use to other appliances.

Miss Miller suggested these seven demonstration ideas

O. C. Small, NEMA; James T. Coatsworth, Edison Electric Institute; John H. Ronayne, Better Light-Better Sight Bureau, all full of business were persuaded to stand still for a minute

Mariquita Dygert, Detroit Edison Co; Letha Strong, Kansas City Power & Light Co; Jane Grau, Duquesne Light Co; Ruth Shank, Union Electric Co, gather for a few words

for the electric clothes dryer:

Dryer vs. line drying to show its time-savingness.

Savings on children's clothes, showing that fewer clothes are needed when dryer is used than in once-a-week washing and line drying.

Open house for contractors to gain their cooperation in planning for installation of dryers in homes.

No-fading story, dramatized by showing samples of dryer vs. line-dried clothes.

Better results, dramatized by towels, dryer-dried vs. line-dried.

A local study by using a prospective dryer customer and checking time and drying problems for two weeks and comparing them with convenience and time saved for two weeks after dryer is installed.

Include laundry equipment in cooking school programs.

Dwelling on freezer demonstrations, Miss Fladoes stated:

"To understand and appreciate the full value of a home food freezer, women need to be shown how to live out of a freezer; how a well-stocked freezer makes meal planning easier; how money can be saved through quantity buying or special sales or saving of garden surplus; or left-overs saved and utilized."

Among the most wanted information on the part of homemakers who already own freezers, Miss Fladoes added, is that on freezing bread and cooked foods, their storage life, and preparation for the table.

Safety in the Home . . . How to handle electrical equipment safely was the consideration of Irene L. Muntz, home service director, Rochester Gas & Electric Corp. She told of her utility's participating in a safety pageant in cooperation with a leading business firm and the Rochester Safety Council.

By contrasting one poorly thought out kitchen plan and living room with a well-prepared one in each case, it was shown how poor arrangement, poor lighting, and confusion make for accidents while good lighting, good arrangement, and adequate wiring contributed to safe living.

This was supplemented by a display of adequate wiring for the home at which were demonstrated both fuse and thermal magnetic breaker installations. Proper number and use of circuits were shown in diagrammatic form.

Helping the Disabled . . . What a utility can do to train the disabled housewife was outlined by Dorothea Underwood, Niagara Mohawk Power Corp. She described the Buffalo (N. Y.) Cardiac Efficiency Kitchen and Laundry located at the University of Buffalo Chronic Disease and Research Center. Operated by the utility's home service department, it is a model layout for homemakers who must conserve their energy because of a heart condition as well as those confined to wheel chairs, using crutches, wearing braces, or minus one or more limbs.

Each home economist spends a full day each week with the clinic. A half day is devoted to home calls, reports, and planning the teaching program. A course starts with a visit to the patient's home to get an accurate account of the patient's background and home situation. Measurements of the kitchen are taken at that time.

Actual training begins with an introduction and explanation of the purpose of the program. There follows a film of a cardiac kitchen, a performance test is given to find out where there is difficulty or fatigue, and instruction is given regarding the patient's special problems. Altogether, 12 hours of instruction are given.

The program has strengthened the utility's public relations. Press and radio have carried the story, and persons have come from all parts of the country, Canada, Norway, and Sweden to see the kitchen and laundry. And new business has resulted.

The Overview . . . How to convince the boss that home service is doing a job was outlined by Elizabeth Parker, Georgia Power Co. A point by point summation of how home service saves and makes money and builds good will must be presented to top management, Miss Parker said, so that "instead of the multitudinous expenses of his Home Service Department, he is conscious of the tangible results and the important fact that these returns will continue to come in year after year."

Residential Sales Section

Sell Electrical Living . . . "Develop a basic sales approach, one that will result not just in single sales but in a whole chain reaction of sales." That was the advice given at

Fred Kimball, Kansas Gas & Electric Co; Mrs J. Paul Brown and J. Paul Brown, Alabama Power Co; Hugh G. Isley, Carolina Power & Light Co agree electricity is a family affair

Tom D. Fulford, Virginia Electric & Power Co; L. L. Peterson, Interstate Power Co; J. D. Howard, Wisconsin Power & Light Co; H. M. Blackburn, Potomac Electric Power Co

T. O. McQuiston, Metropolitan Edison Co; M. G. Kennedy, Ebasco Services Inc; J. M. Stedman, Pennsylvania Power & Light Co; G. R. Parry, Metropolitan Edison Co

the residential section meeting by Harold P. Bull, Bendix Home Appliances, Inc, who spoke on "New Horizons in Residential Load Building."

"Recognize the fact," he said, "that there is a market for all of them (electric appliances) and that a good, well-organized, all-encompassing selling program will help you to take advantage of all these opportunities to build residential loads.

"Big opportunity for new EAR," he said, "is in selling automatic electric living as a package in terms of all the benefits of each appliance. That can be accomplished," he explained, "by educating builders and contractors to put in not just 30 or 60-amp, but 100-amp entrances—so that the home owner can really be able to live electrically."

Selling Ranges . . . The need for aggressive selling was spotlighted by H. H. Brenan, Pennsylvania Power & Light who outlined a coordinated program to sell electric ranges.

He pointed out that range sales were off 24% in 1952 from the year before, and 42% from 1950, a trend that could only be stopped by aggressive utility action and industry teamwork.

He said that the ingredients of good selling are provided in one package, "Women who know . . . cook electrically," co-sponsored by NEMA and EEI, which coordinates the activities of utilities, manufacturers, distributors, and dealers.

Through it, NEMA is encouraging its members to support the campaign in those areas where electric companies conduct sales programs to support the national drive. The activity is scheduled for April and May.

It has not been intended, Brenan said, to make it a prefabricated program requiring a company to follow a set pattern and to purchase a large quantity of promotion materials. It provides a vehicle for a company to design its own program around a national theme and makes available an assortment of excellent promotional materials.

Thirty-seven companies, representing over 7 million meters, have already indicated that they will participate in the two-month program.

Cook's Cookbook . . . Paralleling the range promotion address, was one by Harriet G. West, home service director, Indianapolis Power & Light Co, who described "The New Cook's Cookbook" prepared by the EEI Home Service Committee.

Designed for new cooks—brides, business girls, high school homemaking students, Girl Scouts and 4-H members —the 52-page book, ready this month, is "packed with information and illustrations—ways to use electric appliances and receive a lot of satisfaction doing it."

The book tells the cook how to buy her food economically, store it in her refrigerator or freezer conveniently, cook it electrically, how to serve meals attractively, and wash dishes hygienically.

Selling Lighting . . . How to sell good lighting was demonstrated by George Byington, commercial sales engineer, Wisconsin Power & Light Co. The utility has set up a traveling demonstration to illustrate the recommendations of the booklet, "See Your Home in a New Light," produced by the General Electric Lamp Division. Full scale equipment, which cost $800, is used in living room, dining room, and bathroom scenes, and the recommended application of lighting fixtures is given.

According to Byington, adult groups like to see a limited number of light sources but prefer to see the sources applied to all the different lighting recipes that can be shown. High school assemblies prefer more time on light sources and a shortened version of the application or lighting recipe story.

New Installment Idea . . . An overlooked installment credit system was described by Arthur S. Goldman, director of marketing and research for House and Home magazine. It is the long-term amortized real estate mortgage that can triple utility home modernization volume because it stretches the homeowner's dollar from three to six times as far as traditional consumer credit.

The open-end or additional-advance mortgage, Goldman explained, contains a provision permitting the homeowner to borrow additional funds from his lending institution for repairing, remodeling, or improving the structure covered by the mortgage. Household appliances can be included, and the sum advanced is paid back over the remaining life of the mortgage. The open-end mortgage, he said, makes it a lot cheaper and easier for homeowners to borrow money to improve their property.

Hitch heretofore has been that most lenders could not let homeowners have the added money unless the advance would have the same first mortgage status as the original loan. They need title searches and insurance, and until now cost of these has often been prohibitive.

In about eight states, Goldman said, legislation has been enacted giving first lien status to additional advances up to the original amount of the mortgage, making title search unnecessary. In over 30 states open-end mortgage contracts have first lien status, provided the lender was without notice of the intervening lien.

Last year savings and loans associations alone advanced $197 million worth of this type of credit. It has been estimated that insurance companies, savings banks, and other institutions probably accounted for another $200 million.

One of the chief reasons for mortgage foreclosure, Goldman pointed out, is the homeowner's tendency to overload himself with installment credit. Use of the mortgage as a basic credit instrument would establish the local mortgage lender as a permanent credit counselor to the individual family, while low-cost mortgage credit, intelligently handled, can provide for practically all the homeowner's buying needs.

Commercial Sales Section

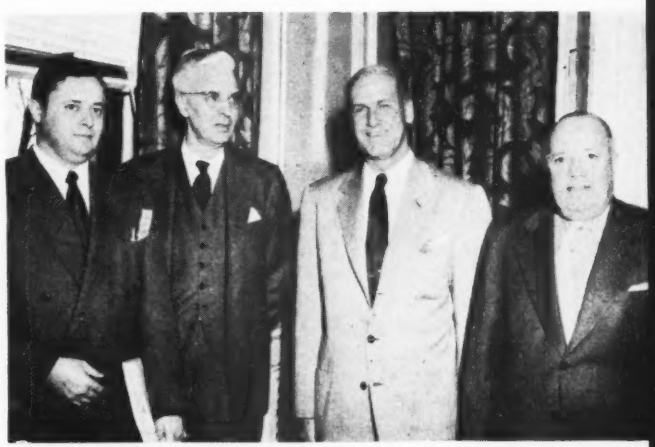
Completed activities of the Market Development and Electrical Applications Committee and the Commercial Cooking Committee were reviewed by S. S. Sansbury, chairman of EEI's Commercial Sales Section.

Projects of the market development group include preparation of the first edition of the commercial sales handbook, "Application of Electrical Equipment in Commercial Establishments." It is a loose-leaf handbook containing basic data on air conditioning, ventilation, electric water heating, electric cooking, and lighting, as well as a section devoted to types of equipment applicable to various classifications of business.

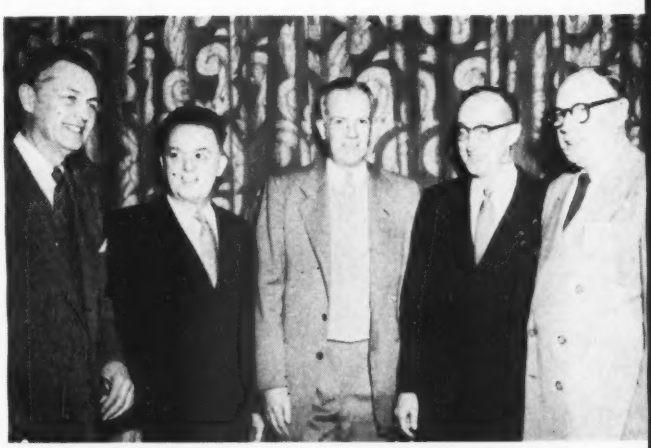
The first two commercial sales bulletins called "Com-

(*Continued on page* 158)

J. F. Morton and J. L. Campbell, both of New Orleans Public Service Inc; J. H. Ahrens, Hartford Electric Light Co and J. R. Guidroz, New Orleans Public Service Inc



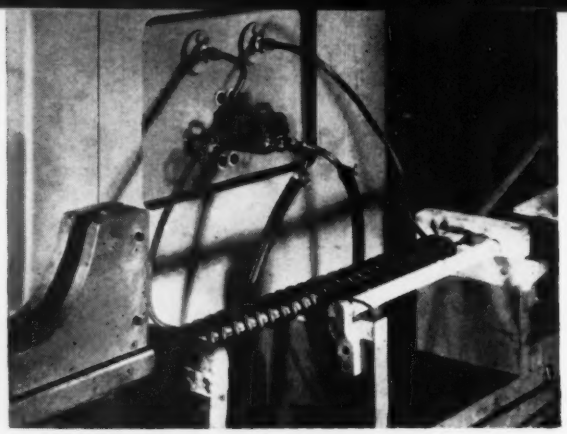
G. T. Bogard, General Electric Co; C. L. Linder, vice president of General Electric Co; J. M. Otter and W. H. Eichelberger, both vice presidents of Philco Corp



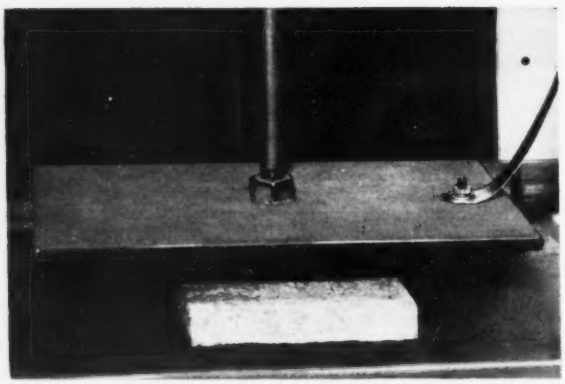
J. H. Jewell, vice president of Westinghouse Electric Corp; H. R. Jones, West Penn Power Co; C. D. Holister, Niagara Mohawk Power Corp; R. W. Butts, Ohio Edison Co; Lee Taylor, Detroit Edison Co

FCC regulation requires that induction and dielectric heating

Sources of Radiation . . .

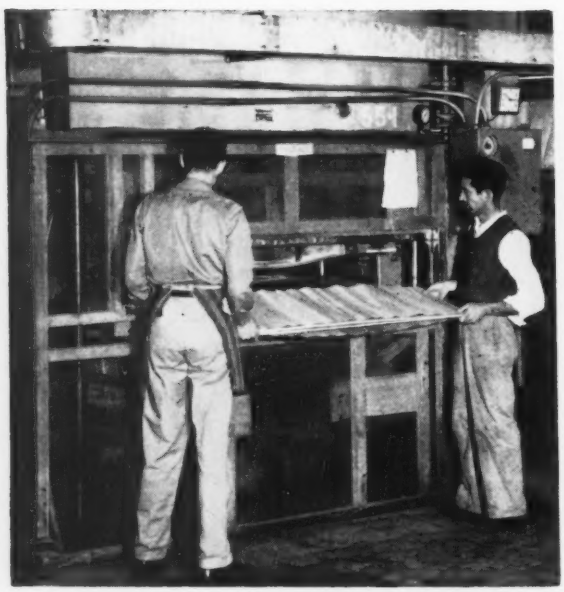


Unshielded Coils and . . .



. . . Dielectric Heating Electrodes

. . . Must be Controlled Before



METHODS OF CORRECTING RADIATION vary according to cause. A cage may be employed to guard zone during heating cycle . . .

. . . for access doors or panels that do not make a good electrical contact to the cabinet copper stripping or bonding strips will help . . .

OTTMAR W. NOESKE, Electronics Section, Allis-Chalmers Manufacturing Co, Milwaukee, Wis.

Certification

Induction heating equipment manufactured prior to July 1, 1947, will have to be certified before June 30 that it does not interfere with radio communications. The Federal Communications Commission has refused to extend the exemption of equipment in violation of Section 18 of its rules beyond that date.

For the past six years users of such equipment have been under order to make modifications so that its operation would not interfere with police signals, aircraft operational channels, radio, and television. Any equipment operating outside the frequency band designated for it must be modified before the FCC will certify it. In most cases shielding is the most effective measure.

What causes radiation? In general, electronic radiation might be broken down into:

1. Radiation from coils or electrodes.

2. Radiation from within a heater cubicle.

3. Radio frequency feedback to input power lines.

Suppressing radiation from the coils or electrodes at the work station is difficult because there is always the necessity of getting work into and out of the heating zone. In some cases the size or shape of the parts makes it virtually impossible to shield the installation and still maintain good material flow. In these cases a shielded room or metal cage enclosing the heater, work position, material handling equipment, and operator may be the only solution.

Fortunately, most applications can be handled so that only heating elements need be enclosed. In this case material is handled on a batch type basis, permitting the heating zone to be enclosed during the heating cycle. Where tunnels act as wave traps, the material requiring heating can pass through the heating zone uninterrupted, without the equipment radiating an objectionably strong signal.

A cage arrangement which can be readily opened for loading and unloading may be used to enclose the heating zone during the heating cycle. In either of these cases the cage and oven serve other purposes besides eliminating the radiation of radio frequency signals. Operating personnel are protected from contact with elements of high potential by means of oven and cage interlocks.

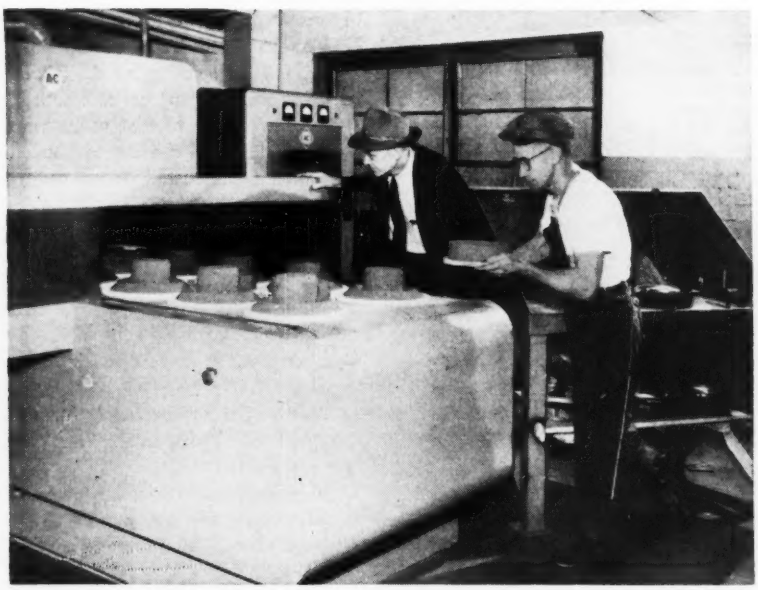
Most up-to-date equipment is being built into radio frequency shielded cubicles. For early models of induction or dielectric heaters which are housed in nonmetallic cabinets, the equipment may be replaced with a more recent design, or a radio frequency tight metallic cubicle or screened room may be built around it. Where the metallic cubicle is used but radiation still exists, there are several possible methods of correction:

1. If the heater contains access doors or panels that do not make a good electrical contact to the cabinet itself when they are closed, the addition of copper weather stripping or copper bonding strips will help correct the difficulty.

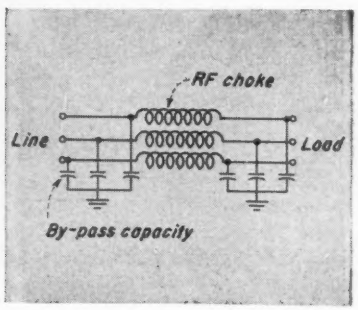
2. If the heater cubicle contains a window or opening that is not covered with screening, copper mesh, soldered over the window or opening, will provide adequate shielding.

3. In some cases the cabinets may be made in sections with inadequate bonding between the sections. To correct this condition such panels should be removed, and the contacting areas and butting surfaces should have paint, rust, and other foreign matter removed. Sections should then be reassembled with precaution to assure good electrical contact.

Radiation from power lines in most cases is the easiest to control. At present many manufacturers are taking care of this problem with a filter network within the heater cubicle. For users of older equipment this filter can be fabricated easily by using components readily available from the radio industry.



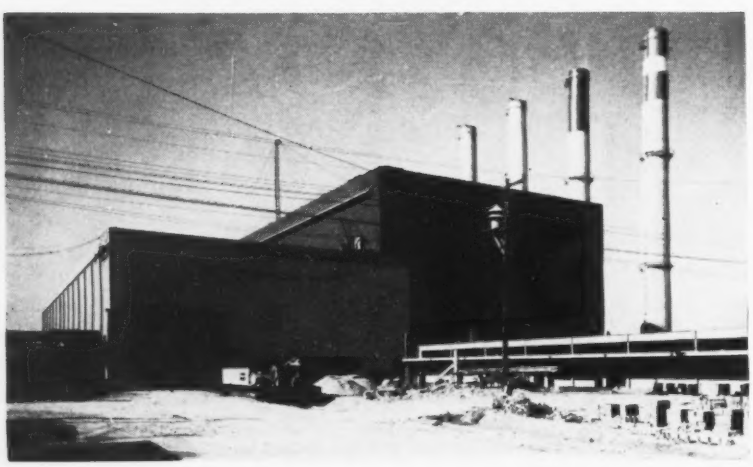
. . . for a conveyor oven assembly, which is usually used to handle large pieces of material or equipment, tunnels at the entrance and exit act as wave traps and reduce radiation . . .



. . . for three-phase installations line filters of the type above will do a good job

TVA Puts First Unit . . .

. . . on Line at Shawnee



The first 135,000-kw unit of Shawnee Plant, Tennessee Valley Authority's largest steam plant, went into commercial operation April 9.

The station, being built on the south bank of the Ohio River, ten miles northwest of Paducah, will supply power to Atomic Energy Commission's Paducah plant now under construction. The atomic energy plant has been receiving some interim power from TVA. Power generated by the new unit not yet needed by the Paducah plant will be fed into the TVA system.

Pictures at the left show lighting-off the boiler of Unit No. 1, turbine room of the plant with Unit No. 1 in the foreground, and an outside view of the plant.

Full Operation in '55 . . . Construction of Shawnee Plant began Jan. 6, 1951. All of the plant's ten units are expected to be in operation by April 1955. The plant then will have a capacity of 1,350,000 kw (1.5 million-kw capability).

Including the brick and glass service bay at the upstream end, the length of the powerhouse as it parallels the Ohio River is 1,063 ft. Structural steel forms the framework. The portion housing the ten boilers, the coal bunkers, and related equipment rises 100 ft above the ground and is sheathed in reddish brown corrugated metal. The adjoining turbo-generator room is encased in brick and glass block.

The 3,600 rpm turbines will operate at 1,800 psi, 1,000 F.

The basement floor of the powerhouse is 40 ft below ground. The condensers installed in the basement will use water at the rate of more than a million gallons a minute to condense the steam exhausted from the turbines.

Four Stacks Completed . . . A single file of ten outside stacks will rise 250 ft along the river side of the boiler room. Four are now completed. The stacks are made of concrete lined with brick.

Width of the powerhouse including the area for the stacks is 386 ft at ground level.

If operated at 80% load factor, the ten-unit plant will use about 4 million tons of coal a year and generate 10 billion kwhr.

Estimated cost of the plant is $216,500,000 or $144 per kw of capability.

FHA Water Heater Standards...

. . . are expected to be scaled down. Agency has been under fire from gas, electric industries since it revised requirements

Federal Housing Administration is about ready to scale down standards for water heaters in homes which are to be built with federally insured financing.

As the agency that administers the home financing insurance program, FHA sets the minimum standards for material, equipment, and construction of the homes eligible for government-backed mortgages. It has been under fire from both the gas and electric industries since last December for its revised requirements for water heaters. Each of the competing industries has accused FHA of writing the heater standards to help the other.

The agency is now taking another look at its water heater requirements and staff members of the FHA underwriting section are fairly well agreed the standards will be lowered. The gas and electric industries appear to have gotten across their point—that there are inequities in the present requirements and that the sizes of the water heaters called for are just too large. A revision of the requirement is now in the works and may be released within the next few weeks.

Present Standards . . . Present FHA standards for a one bath, three-bedroom dwelling call for gas water heaters to have the equivalent of 40 gallons of storage and 20 gallons per hour of recovery. The recovery figure means the heating unit must have the capacity to raise the temperature of the 20 gallons of water 100 deg F in one hour.

For electric water heaters, present standards require the equivalent of 66 gallons of storage, 12 gallons per hour recovery and a 3,000 watt input.

These new standards became effective last December for new FHA applications. Homes that were started soon after that are now getting to the point of installing the water heaters, and the fracas over the new standards has just begun in earnest.

Utility Protests . . . Florida Power Corp has been one of the most vocal in protesting the new requirements. It neither sells nor services water heaters, but it does furnish the electric energy for them in its service area. It has argued that the requirements are forcing home builders to turn to gas heaters because of the size of electric heaters demanded by FHA.

National Electrical Manufacturers Association also has registered a strong protest, arguing that the new regulations are hurting sale of electric water heaters.

Some of these electrical interests have even gone so far as to accuse FHA of writing the regulation to suit the gas utilities and appliance makers. But, on the other hand, FHA reports that protests have been equally strong from the gas industry, which has charged the regulation was rigged to favor the electrical equipment manufacturers and electric companies.

Previous to the issuance of the present standards for water heaters, FHA had a sort of sliding scale for heater standards that applied to all types of dwellings. Under those standards, a tankless heater was to have 180 gallons per hour of recovery, a 20 gallon storage heater was to have 22½ gallons per hour of recovery, a 30 gallon storage unit was to have 17½ gallon per hour of recovery.

These standards, both present and past, are the minimum standards set by the federal agency. Local FHA offices have the authority to apply more rigorous standards under varying circumstances.

Boiler Explosion Delays Operation of Joppa Unit

A boiler explosion April 11 at Electric Energy, Inc's Joppa (Ill.) steam plant now under construction will delay operation of the first 156,000-kw unit until about May 1. The explosion occurred when the unit was being put through tests and was carrying "some" load. Damage was estimated at $50,000.

Electric Energy had hoped to have the unit on the line April 11 (EW, April 13, p 10).

According to Turner White, Electric Energy vice president, the accident occurred this way: Three coal pulverizing mills jammed. Feed water pumps tripped off because of lack of suction. In the succession of events that followed fire was lost in the coal furnace. But some unburned fuel remained in the furnace and became ignited causing the explosion. At the time of the blast load had been removed from the turbine-generator and its switch was open.

POWER BRIEFS

- An earth fault is delaying work on Folsom Dam, near Sacramento, Cal. The fault is in a "substantial" part of the left abutment, 30 ft under the foundation. It failed to show up in initial exploration or during rough excavation. Discovery of the weakness now is interfering with concrete pouring. A large section of trestle used in concrete operations will be removed to allow mining of rock overlaying the faulted area. Concrete will have to be trucked from the mixing plant for the dam's midsection. Construction of the 162,000-kw power plant at the damsite will not be affected.
- New production records were set at Bonneville Dam powerhouse during March with a total of 424,547,000 kwhr during the 31-day period. This tops previous record of January 1952 by almost 17 million kwhr.
- Interchange of power between Detroit Edison and Ontario Power Commission is awaiting Senate approval for the construction of two high voltage lines—one between Fort Huron, Mich., and Sarina, Ont., the other connecting Detroit and the J. Clark Keith station in Ontario.
- First gas-fired unit with reheat in the U. S. is part of the equipment for Louisiana Power & Light Co's multimillion dollar addition to Nine Mile Point Station, scheduled for completion in 1955. Producing 135,000 kw, the unit will have 1,005 deg boiler with television control.
- Approval of export-import plans for exchange electric power among member countries has been announced by the Organization for European Economic Cooperation, effective April 8. Nations affected are Austria, Belgium, France, Germany, Italy, Luxembourg, Switzerland, and Holland.

Other items in the week's news will be found starting on page 233.

PORTABLE TV RECEIVER in test car along with radio and TV frequency equipment . . .

WITH TV ANTENNA car traces interference to

VOLTMETER AND VARIAC locate source of another complaint

SIGNAL STRENGTH is measured by car equipment in this TVI method

TV Interference—The Utility's Story

Where the troubles come from and what the companies are doing about it

Survey of experience of 20 utilities across the country reveals the following data:

1. Most companies do not seek or publicize TV problems, but all respond to complaints and help customers localize and repair conditions. Many utilities have field cars equipped to detect TVI and locate its source. Several bring TV sets into customers' houses to compare with their own sets. Distribution engineers and linemen are learning to recognize and eliminate TVI sources on utility lines.

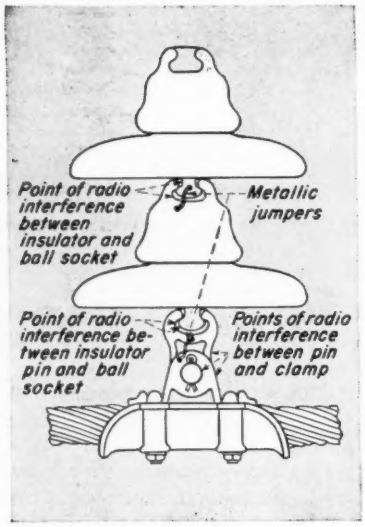
2. From 40 to 50% of complaints trace back to trouble in the customer's TV set.

3. From 25 to 30% of TVI emanates from customer appliances. Typical trouble sources are

Small commutator motors
Heating pads
Refrigerators

source, later checks repair effectiveness

PORTABLE RADIO is used to run down TVI source not accessible with the test car facilities


Point of radio interference between insulator and ball socket
Metallic jumpers
Point of radio interference between insulator pin and ball socket
Points of radio interference between pin and clamp

JUMPERS Cure TVI from insulators

Utilities Classify Their TVI Responsibilities

Utility	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Loose tie wires	S			S	S		S	S		S				S	S	S	S	S
Loose & corroded hardware		S	S		S					S	1	124	13		S	S	S	
Poor guy wire banding					S					S	1		19	S	S	S	S	S
Cracked insulators, lightning arresters					S				3		2	22	S	S				S
Loose ball-and-socket insulators		S	S		S		S			S	1	16	15	S			S	S
Street light faults grounds, lamps					S	S		S	14		2		23					
Dirty insulators		S								S					S			
Loose insulator pins			S															
Metal crossarms	1																	
Tree limb arcs							1				1		1	S				
Primary insulation burner through									16									
Loose connections									1			32					S	
High tension corona									7									
Split-bolt connectors										S								
Lightning arrester touching bracket											2							
Arcing in watt-hour meters											1		1	2				

Note S = Several

Doctor's equipment, especially diathermy
Neon and fluorescent lights
Old fashioned tungsten lamps

4. From 10 to 15% of complaints are traceable to utility equipment.

5. About 5% of TVI comes from radio transmitter equipment and industry equipment such as welders and HF heaters.

The major utility liability in TVI lies in voltage regulation. Nominal 115-v lines dropping to 108 v set telephones ringing with complaints. One company boosted their line to 118-v and found complaints much less frequent.

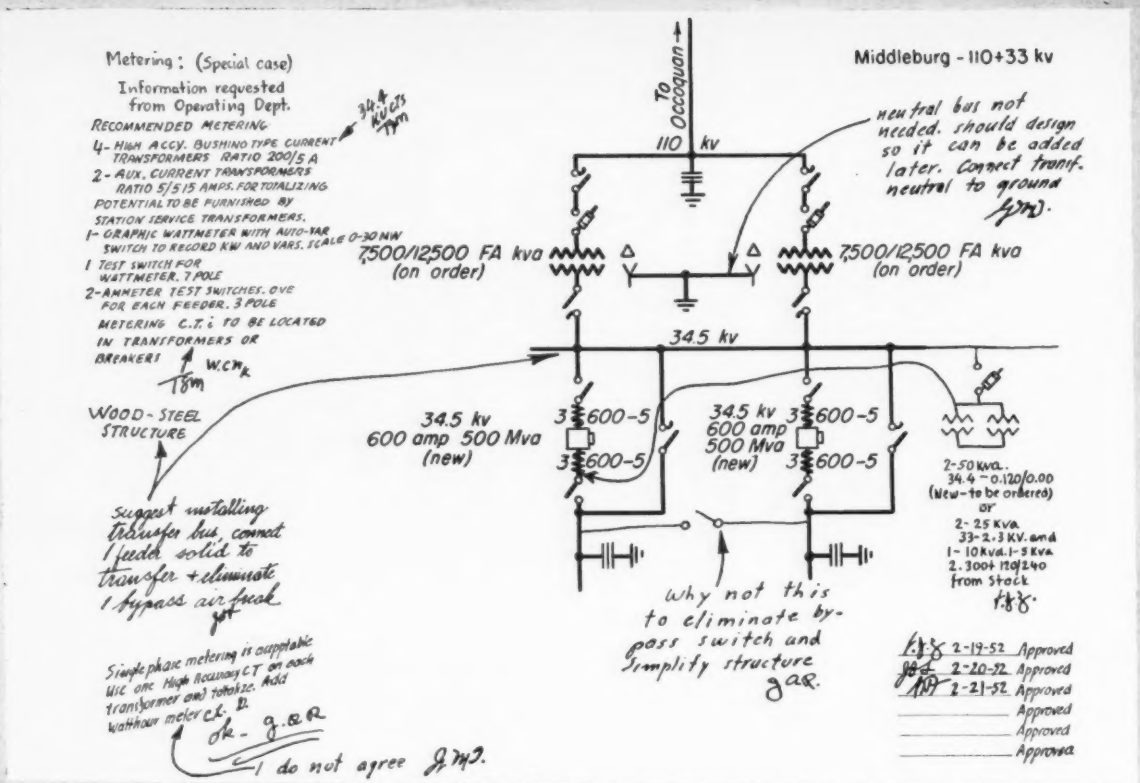
Line equipment causes trouble, and remedies are taken, in the following order:

Loose tie wires—Tighten or reinforce
Lose and corroded hardware—Clean and tighten
Poor guy wire bonding—Replace with double-nut bonds
Cracked insulators, arrestors—Replace
Loose ball-and-socket insulators—Flexible jumper
Street light faults: bad grounds, carbon lamps—Repair, replace
Dirty insulators—Wash
Insulator pins loose—Tighten or replace
Metal crossarms—Replace with wood

(Complete complaint summary is shown in table.)

Indications are that TV will demand rigorous maintenance of utility equipment, wherever electrostatic charges may be generated. It doesn't look like any once-and-for-all solutions can be found, except possibly for perennial trouble-makers like ball-and-socket insulators.

Proposed Middleburg


Metering: (Special case)
Information requested from Operating Dept.
RECOMMENDED METERING
4- HIGH ACCY. BUSHING TYPE CURRENT TRANSFORMERS RATIO 200/5 A
2- AUX. CURRENT TRANSFORMERS RATIO 5/5/5 AMPS. FOR TOTALIZING POTENTIAL TO BE FURNISHED BY STATION SERVICE TRANSFORMERS.
1- GRAPHIC WATTMETER WITH AUTO-VAR SWITCH TO RECORD KW AND VARS. SCALE 0-30 MW
1 TEST SWITCH FOR WATTMETER. 7 POLE
2- AMMETER TEST SWITCHES. ONE FOR EACH FEEDER. 3 POLE
METERING C.T.'s TO BE LOCATED IN TRANSFORMERS OR BREAKERS
WOOD - STEEL STRUCTURE
Suggest installing tie-transfer bus, connect 1 feeder solid to transfer + eliminate 1 bypass air break
Simple phase metering is acceptable Use one High Accuracy C.T. on each transformer and totalize. Add watthour meter C.T.
I do not agree
To Occoquan
110 kv
Middleburg - 110+33 kv
neutral bus not needed. should design so it can be added later. Connect transf. neutral to ground
7,500/12,500 FA kva (on order)
7,500/12,500 FA kva (on order)
34.5 kv
34.5 kv 600 amp 500 Mva (new)
3 600-5
3 600-5
34.5 kv 600 amp 500 Mva (new)
3 600-5
3 600-5
2-50 kva. 34.4 - 0.120/0.00 (New - to be ordered) or 2-25 kva 33-2.3 kv. and 1-10 kva. 1-5 kva. 2.300+ 120/240 from Stock
Why not this to eliminate by-pass switch and simplify structure
2-19-52 Approved
2-20-52 Approved
2-21-52 Approved
Approved
Approved
Approved

TENTATIVE ONE-LINE DIAGRAM provoked objections and suggestions from individual members of working group before design was started

One-Line Diagram Saves Engineering

F. W. SMITH, Engineering Consultant, Virginia Electric & Power Co, Richmond, Va.

Conference development and approval of the one-line diagram ease the engineering manpower requirements of a heavy construction program for Virginia Electric & Power Co. Such a diagram has always been prepared eventually for operation and for record purposes. The difference is that the diagram now is prepared before design is begun, and this diagram serves as a guide throughout design and construction also.

This procedure has been followed for several years. It has been applied to 200 projects a year, varying from small low-voltage substations to large transmission stations. It is credited with saving 8,000 manhours each year—4,000 each of engineering and drafting time. The one-line diagram has definitely helped the engineers to get their work done.

Confronted by a post-war demand exceeding all expectations, the company found itself unable to expand its engineering force enough to handle the increased work with existing procedures. Recognizing merit in one engineer's suggestion, "Let's make the one-line first, get it approved by everyone, then go ahead", it established a new procedure.

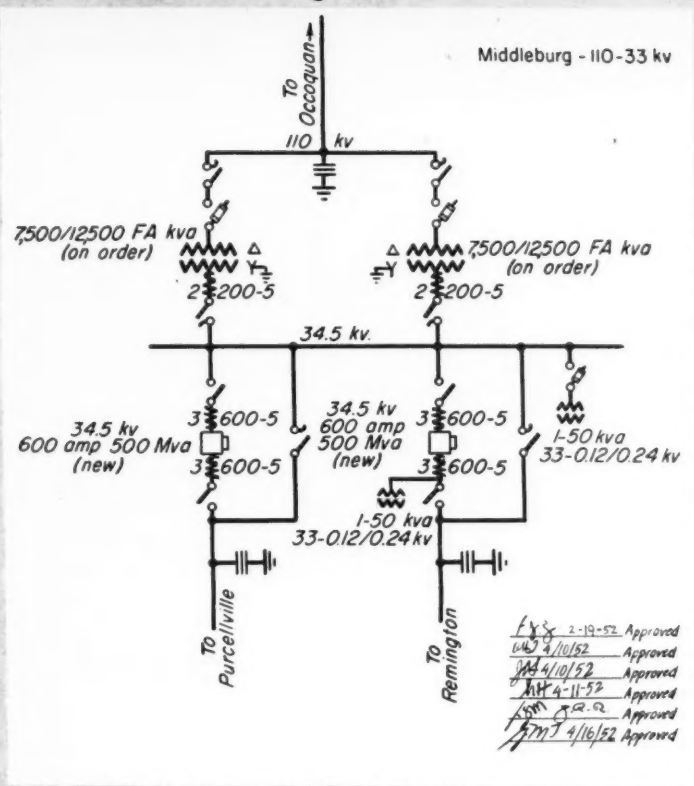
Each substation job must first be authorized in the construction budget. This authorization defines general requirements and approximate cost. A project engineer then prepares a preliminary one-line diagram with pencil on vellum or tracing paper, indicating new work by heavy lines, the existing facilities by light lines. He is guided by the budget description and the operating district but leaves questionable features for discussion by the working group.

This working group consists of the project engineer, planning engineer, distribution engineer (liaison with operating district), transmission engineer, substation engineer, supervisor of electric equipment and transmission (responsible for operation, relaying, control, metering, and communication), and chief engineer.

When unusual problems are involved, a specialist in control, communication, metering, real estate, or maintenance may be called in.

The preliminary one-line is routed to these representatives in turn. Each one adds his comments or approval to the drawing. When questions arise, conferences are called to discuss them and to determine proper solutions. But completion of this procedure either approves the preliminary one-line or tells the project engineer what changes are required for approval.

Copies of the approved one-line are distributed to the system operating de-



CONFERENCE WON AGREEMENT on revised one-line, expediting design and construction

Time

partment, the district superintendent, and the supervisor of drafting. Each thus knows what is proposed for the substation, and the draftsman has data from which to prepare construction plans.

Conference Clears Middleburg Plan . . . When, following this procedure, the preliminary one-line for Middleburg substation completed its routing through the working group, many notations indicated lack of agreement. The chief engineer thereupon called a conference, calling attention to the need for this 115-kv, 15,000-kva transformer station.

The project engineer confirmed adherence to budget specifications, requested discussion of points in question.

The planning engineer cited calculating board data, approved the proposal for system capacity.

The distribution engineer approved the proposed location for ability to serve sub-transmission load via existing line facilities.

Expansion at Site Possible . . . The transmission engineer approved the adequacy of the site for the future installation of larger transformer banks and extension of the 115-kv transmission without changes. He also advised that a 34/12-kv step down could be added for future local distribution.

The supervisor of electrical equipment and transmission expressed the operating opinion that a single switch 34.5-kv tie structure could replace the proposed two bypass switches. He further proposed that the station service be two 50-kva units, one connected to the 34.5-kv bus and the other to one outgoing circuit, to protect against loss of potential to operate the circuit breakers during 115-kv trouble.

The substation engineer advised that major equipment was on order, raised the question—what to provide for metering?

The meter engineer, called in to advise, proposed four high-accuracy, bushing-type CT's, totalized by two auxiliary CT's to operate one ammeter and one recording watt-var meter with kwhr register.

The control engineer, also called in, suggested that the CT's be installed on the 34.5-kv transformer bushings.

Metering Suggestions Made . . . The operating engineer suggested that single-phase current from two bushing-type CT's should be adequate metering.

The chief engineer accepted the station service proposal, the standard bypass switch arrangement, and the meter engineer's proposal for three-phase metering. He then instructed the project engineer to revise the one line and circulate it for signatures. In this manner, binding agreement upon electrical characteristics was achieved before design was started.

WORKING GROUP DISCUSSES ONE-LINE. Members are (left to right) L. D. Johnson, planning engineer; J. D. Shaw, transmission engineer; F. J. Zak, electrical engineer; J. A. Rawls, supervisor electric equipment and transmission; W. P. Angle, Richmond district superintendent of substations; S. H. Fletcher, distribution engineer; and E. F. Eldred, substation supervisor

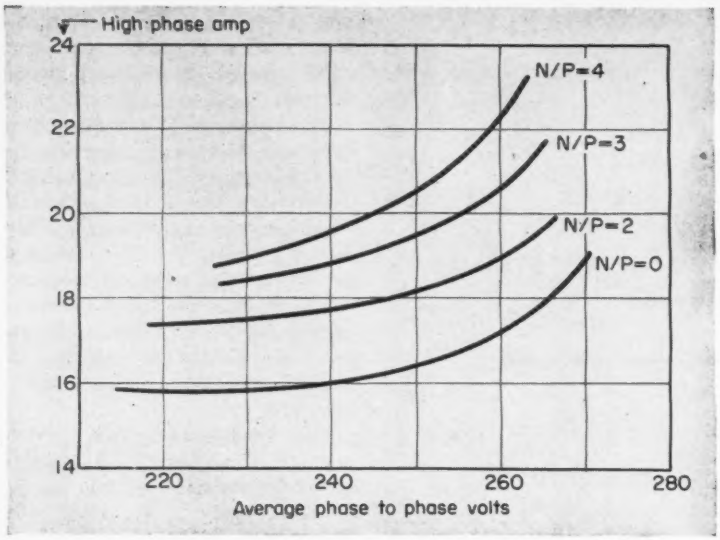


FIG 1—TESTS ON COMPRESSOR MOTOR of 5-ton air conditioner show how voltage unbalance increases current. N/P denotes the ratio of negative to positive sequence volts

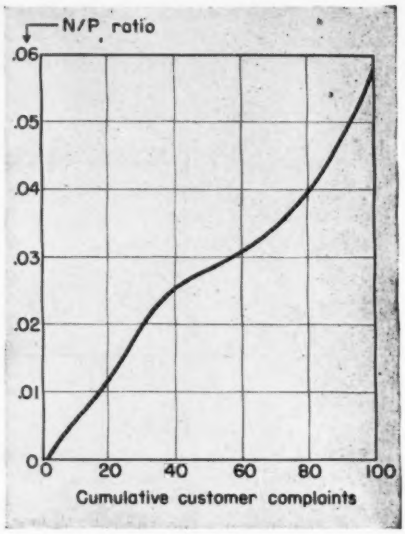


FIG 2—CUSTOMER COMPLAINTS are few when N/P voltage ratio is less than 0.02 or 2%

Packaged Air Conditioners Demand Balanced Three-phase Voltage

B. M. GALLAHER, Senior Engineer, Texas Electric Service Co, Fort Worth, Texas

Voltage unbalance is proving critical in electric service for the three-phase "packaged" air conditioning units now being installed extensively in homes and small commercial establishments. Three-phase service frequently is required in areas where single-phase distribution is the accepted system. Common practice in such cases is to convert the existing service to a four-wire delta combined light and power. Voltage supplied in this manner may have enough phase unbalance to overheat the driving motors.

On a typical 5-ton unit, as little as 1.15% unbalance at rated (100%) voltage increased the current in the high phase of the motor to the same value as the balanced current resulting from 116% balanced voltage. Three percent unbalance at 105% of rated voltage caused 19% increase in the current in the high-phase. Greater unbalance caused marked increase in current, as shown by Fig. 1; whereas reasonable variations in balanced voltage had negligible effect.

Voltage unbalance is defined as the ratio of negative to positive sequence voltages and designated as the N/P ratio. With this approach it is convenient to visualize the analogy of two motors coupled to a common shaft. The first is the "real" motor which is supplied only with positive sequence voltage, while the second, or "phantom" motor carries only negative sequence voltage and opposes the rotation of the "real" motor.

As the negative torque in the "phantom" is proportional to the square of the negative sequence voltage, it is apparent that as the negative phase sequence voltage inrceases its opposing torque increases at a greater

Principal Causes of Unbalanced Voltage

Cause	Approximate Magnitude of Voltage Unbalance High to Low Phase — %	Net Effect on Secondary System		
		Wye 120/208 (1)	Delta (4) 120 240	
			Open	Closed
1. Primary Unbalance due to phase-to-neutral unbalanced load	2–10 (2)	Small	Large	Small
2. Primary Unbalance due to phase-to-phase unbalanced load	1–3 (3)	Medium	Large	Medium
3. Taps on Transformers on different ratio	2½–13	Medium	Large	Small
4. Dissimilar Transformer Impedances	1–2	Small	Medium	Small
5. High ratio of 1 load to 3 load on transformer secondary	1–5	Negligible	Small	Medium

(1) Delta-wye bank, however, the wye-wye bank will give comparable phase-to-phase balance. Phase-to-neutral voltages on wye-wye may be badly unbalanced.
(2) Primary voltage — phase-to-neutral
(3) Primary voltage — phase-to-phase
(4) Wye-delta, or open wye-open-delta

WASHINGTON COMMENT

JESSE MOCK

Ancher Nelsen, soon to move in as Rural Electrification Administrator (EW, April 6, p 72), appears to be just the fellow the Republicans were looking for to fill the job.

Few positions in government offer as much opportunity for direct contact with the nation's farmers as does the REA post. Political importance of it can be measured to some extent by the rapidity with which the Eisenhower administration moved to place a Republican in the position.

In a Dirt Farmer the GOP Finds Ideal REA Head

It was vital that President Eisenhower choose a man fully in sympathy with the administration's philosophy. Also needed was a man with some political seasoning who could express that philosophy in an attractive manner. Along with these two requirements, the prospect must have a good background in the actual operation of the Rural Electrification Program.

Nelsen Has Political Experience . . . Probably few men in the nation could fill these requirements as well as the 48-year-old, Minnesota dirt farmer, who is leaving his cozy spot as lieutenant governor to come to Washington.

Fifteen years in the Minnesota legislature has helped Nelsen amass a wealth of political experience that compares favorably with that of any of the top men in the Eisenhower administration. His inauguration as lieutenant governor in January was another step upward that many of his colleagues in the state believed would eventually lead to the top political job in the state.

While serving in the legislature, Nelsen also served on the township and school boards in his community in McLeod County. He is leader in 4-H Club work, farm bureau activities, and many cooperative efforts. He is president of the Minnesota Association of Mutual Insurance Companies.

As a farmer in need of central station electricity, Nelsen helped to organize the rural electric co-op in his home county. He is now president of the co-op, McLeod Cooperative Power Association of Glencoe, Minn. First pole to be set by the co-op is about a mile from Nelsen's farm. The prospective REA Administrator boasts of the business basis on which the co-op has been operated.

Now serving 4,000 customers, the co-op borrowed $1,906,00 from REA. It paid $527,558 in advance, and has made regular payments totalling $507,690. Including interests, net obligation of the co-op to the government is now $871,000.

Was a Co-op Leader . . . Nelsen's leadership in his co-op attracted wide attention and until last month he served as vice president of the Minnesota Statewide Cooperative Association.

But it is his attitude toward rural electric cooperative problems that will loom large in his new job. One of these problems is getting a dependable source of power for co-op needs.

Nelsen believes that farmers should have the right and the ability to generate their own electricity if necessary. But he believes they should resort to generation only if they cannot find a cheaper and dependable source elsewhere. His own co-op buys power from a municipal system and from an electric company, and he noted in recent testimony before a Senate committee that the company rate is slightly lower.

Nelsen was one of the leaders in working out a cooperative approach to bring federally generated power to Minnesota customers. This plan, twice turned down by Congress, envisions participation by the federal government, electric companies, and co-ops (EW, March 17, 1952, p 7).

Explaining this plan to a Senate Appropriations Committee last year, Nelsen said. "I believe that this program here indicates the kind of attitude that we hope can sort of move all over the country, where we tolerantly regard the other person's position."

Perhaps his attitude toward generation and transmission by rural electric co-ops is more succinctly stated in the Republican platform of last year, which he helped to write:

"We support the prinicple of bona fide farmer-owned, farmer-operated (electric) cooperatives . . . with federally assisted production of power and facilities for distribution when these are not adequately available through private enterprise at fair rates."

The Minnesotan is not likely to forget these principles and these words when he moves into the top REA office. He has a way of remembering things back home.

Nelsen closed his testimony before a Senate committee in Washington last year with these parting words: "Mr Chairman and gentlemen of the committee, I thank you very much, and I hope to get on the corn planter tomorrow afternoon."

TECHNICAL NOTES

ARCHER E. KNOWLTON

Mobile, truck-mounted cranes can be teamed up in pairs or foursomes anywhere on the system to lift heavy loads, thus eliminating need for permanent and seldom-used overhead cranes. The same idea could be applied to lifting stators and rotors in outdoor steam stations.

Cable with swaged aluminum sheath has been produced in England to the total of 1,100 miles of paper insulated and 900 of rubber insulated.

Aluminum has 40% greater thermal expansion than copper and, if used as a cable conductor, would subject the lead sheath to greater distention and shortened life.

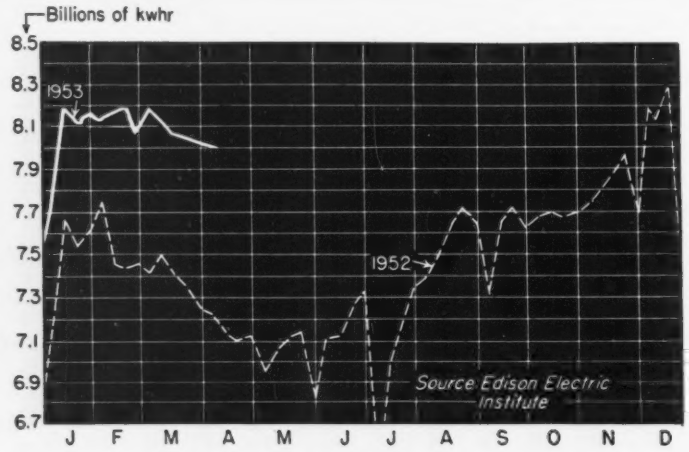
System kilovar capacity should be based on the kilovar loads with an added reserve for contingencies. No different from kilowatts.

Electricity production from cells which oxidize the fuel electrochemically can theoretically be far more efficient than the combustion cycle for steam generation.

Lightning damage to transformers is becoming an unfamiliar circumstance now that impulse testing has provided the proofing.

Tomic energy is really a more precise designation. In Greek a=not and tom=splittable. They imagined the a-tom to be non-splittable. We get terrific energy because it **is** splittable. Tomic. Q.E.D.

STATISTICS



Output Week Ended April 11—8,001,165,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
April 11	+11.8	+13.1	+6.8	+11.4	+8.9	+12.3	+10.0	+16.7	+15.3	+22.0
April 4	+11.1	+10.4	+7.0	+10.9	+9.2	+13.4	+6.4	+14.6	+11.0	+20.3
March 28	+11.2	+12.5	+7.3	+10.1	+7.5	+14.0	+4.6	+13.2	+10.7	+25.0

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Dec.	75.5	72.8	70.4
Capacity (Million Kw)	Feb.	82.83	82.38	75.99
Production (Billion Kwhr)	Feb.	33.60	36.66	31.54
Hydro		8.99	9.26	9.46
Fuel		24.60	27.40	22.07
Fuel Consumption				
Coal (Million Tons)	Feb.	9.16	10.49	8.74
Oil (Million Barrels)		6.81	7.70	4.77
Gas (Billion Cu Ft)		57.82	60.06	54.82
Sales (Billion Kwhr)	Jan.	32.07	31.20	29.72
Residential		9.82	8.91	8.87
Commercial		5.37	5.21	4.99
Industrial		14.90	15.11	13.90
Other		1.97	1.98	1.95
Net Income Class A & B Companies ($ Million)	Dec.	99.24	79.81	88.74
Estimated Dec. '53 Peak (Million Kw)	Dec.	87.0	87.3	88.5
Kwhr per Residential Customer (12 Month Average)	Dec.	2,169	2,155	2,004
Revenue per Kwhr Residential Service (12 Month Average)	Dec.	2.77¢	2.77¢	2.81¢
Canadian Production (Billion Kwhr)	Jan.	5.66	5.54	5.27

Business Statistics

FRB Industrial Production Index†††	Feb.	235*	232**	218
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	343.4	342.6	337.1
E. W. 5 Industry Production Index	Jan.	130.0*	129.8**	124.4
ENR Construction Cost Index††	Mar.	123.2	123.1	115.4
BLS Consumer Price Index	Jan.	190.4	190.7	189.1
NEMA Insulation Materials Sales Index†	Jan.	643	655	548
NEMA Electric Appliance Sales Index†		293	268	273
NEMA Household Refrig. Sales Index†		192	147	153
Metal Prices (April 9)				
Copper, Conn. V., lb		$.30	.27½-.34	.24½
Lead, N. Y., lb		.13	.13½	.19
Zinc, prime Western E. St. Louis, lb		.11	.11	.19½
Tin, Straits, qual. N. Y. lb		1.11½	1.21½	1.21½
Aluminum, ingot, base price		.20½	.20½	.19
Nickel, base price		.60	.60	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Preliminary ** Revised † 1936=100 †† 1949=100 ††† Unadjusted

How Much Electricity Does Industry Purchase?

The total cost of electric energy purchased for use in manufacturing plants during 1951 amounted to $1.5 billion according to the latest Annual Survey of Manufactures. This represents a 15.7% increase over 1950.

Purchases during 1951 totaled 146.5 billion kwhr, an increase of 11.7% over 1950.

The 1951 Survey carries forward the key measures of manufacturing activity. It provides up-to-date basic statistics on manufacturing to the business community, Government and the public. At the present time, this information furnishes a background against which can be measured the impact of the mobilization effort on all important segments of manufacturing.

Purchases of Electric Energy by Manufacturers
Millions of Dollars

	1951	1950	1947
Food	149.9	140.2	108.5
Tobacco	3.0	2.7	2.8
Textiles	111.6	107.0	82.5
Apparel	32.2	28.7	20.6
Lumber	46.6	36.8	20.0
Furniture	19.8	14.3	11.7
Paper	67.6	63.2	50.6
Printing and publishing	44.5	13.7	23.8
Chemicals	142.9	121.1	85.4
Petroleum and coal	40.7	36.3	28.3
Rubber products	30.7	28.8	24.7
Leather	11.7	10.6	8.9
Stone, clay, glass	89.5	76.6	54.9
Primary metal	295.8	253.4	188.8
Fabricated metal	81.8	69.4	54.0
Machinery (except electrical)	101.6	82.9	72.0
Electrical machinery	52.1	44.8	34.6
Transportation equipment	91.3	77.8	59.3
Instruments	10.0	8.7	6.8
Miscellaneous	35.1	25.5	17.5
All Industries	**1,458.5**	**1,260.2**	**954.7**

Purchases of Electric Energy by Manufacturers
Millions of Kwhr

	1951	1950	1947
Food	11,085	10,827	8,427
Tobacco	202	186	155
Textiles	11,184	10,715	8,288
Apparel	*	*	837
Lumber	3,199	2,841	1,503
Furniture	1,133	856	705
Paper	8,203	7,697	6,175
Printing and publishing	2,514	1,738	1,251
Chemicals	18,453	16,001	11,963
Petroleum and coal	5,150	4,721	3,753
Rubber products	3,149	3,008	2,650
Leather	627	592	475
Stone, clay, glass	8,667	7,715	5,865
Primary metal	42,893	38,818	31,428
Fabricated metal	5,591	4,793	3,739
Machinery (except electrical)	7,422	6,034	5,401
Electrical machinery	4,487	3,888	3,156
Transportation equipment	8,134	6,991	5,552
Instruments	662	579	456
Miscellaneous	2,115	1,568	1,043
All Industries	**146,531**	**131,222**	**102,822**

Source: Bureau of the Census
* Withheld

FINANCIAL

SEC May Soon Ease Rules . . .

. . . on sale of common stock through pre-emptive rights to stockholders. Staff informally approves two sales competitively

Public utility holding companies may find it easier in the future to turn directly to competitive bidding in selling new issues of common stock.

Pre-emptive Rights . . . Until now Securities and Exchange Commission has required these regulated companies to extend pre-emptive rights to stockholders. This gives these holders a first crack at buying additional stock issued by their company. Usually it meant that shareholders could get an 8 to 10% discount on new shares.

But in two recent cases, SEC staffers have informally approved new financing plans by utility holding companies which would permit the sale of the whole issue of common through competitive bidding. One of these holding companies, Columbia Gas System, has asked for SEC approval to sell 1.7 million shares competitively.

The full five-man commission will get a chance to go on record when it acts on the Columbia application—probably within a month or two. Thus far there has been no hint of opposition to relaxation of the pre-emptive rights requirement, but interested parties still have time to demand a hearing on the Columbia application.

SEC's Liberalizing Policy . . . Barring unforeseen opposition, the commission is expected to go along with its staff in approving the application and another soon to be filed by American Gas & Electric Co for the sale of 800,000 additional shares of common through competitive bidding. Informal conferences between the companies and the SEC staff have indicated the commission will not oppose liberalizing this policy.

Since there are two places on the commission that could be filled by the new Administration, there is always the chance that the new members might have a different idea. Relaxation of the rights requirement, however, would seem to fit in generally with President Eisenhower's stated policy of easing governmental controls as a means of spurring business activity.

SEC staffers do not contemplate doing away with pre-emptive rights entirely. Far from it. Holding companies will still have to give some valid reasons for shifting directly to competitive bidding. What the change means is simply that SEC is now in the mood to be more lenient in accepting these reasons than it has been in the past.

Reasons . . . Holding companies want this less stringent policy mainly for these reasons:

- They will have to sell fewer shares to raise a fixed amount of capital. By offering the new shares at competitive bidding, they will be getting the last dollar out of the issue, rather than giving present stockholders the usual 8 or 10% discount. This means less dilution of the earnings.
- They can make the offering over a shorter period of time, thus stabilizing the selling price. Under pre-emptive rights offerings, the sale had to be open over a 15-day period. This sometimes caused wide fluctuations in prices at which the stock was sold.
- Sale at competitive bidding tends to enlarge the list of security holders—giving the company a wider base of financial support.

For months the SEC has been considering the possibility of liberalizing this policy on pre-emptive rights. Continuing expansion program of the utilities have forced them to make frequent new common stock issues to finance construction. This means they have had to go to their stockholders time and again to sell additional stock. In time the stockholders get a little more reluctant to pick up the new stock for a number of reasons. Probably the main reason is simply that the shareholder feels he has enough of a certain holding company in his portfolio.

Holders Slow in Exercising Rights . . . In any event, after a number of issues the stockholders are slower to act in exercising pre-emptive rights. This has led a number of utility holding companies to seek SEC approval of resorting directly to competitive bidding.

Several of these companies have submitted results of their recent offerings. These figures helped convince the SEC staff that it is time to try, in selected cases, a waiving of pre-emptive rights in favor of direct competitive bidding.

Except in unusual cases, SEC has required public utility holding companies to extend the rights since it took over the regulation of the holding companies in 1935. It was considered one way of curbing the issue of new stock to "insiders," an abuse that was exposed in the investigation

PUC Surcharge Hearing Delayed

Oregon Public Utility Commission hearings on four complaints attacking surcharges on private utility billings to recoup abnormal steam generating costs caused by the September-January hydropower shortage won't be held before adjournment of the state legislature unless the lawmakers stall in the race to close up shop (EW, April 6, p 100).

Amendment of one of the complaints against Mountain States Power Co, one of the three private utilities involved, has upset Commissioner Charles H. Heltzel's hopes of airing the controversy while the lawmakers were still in session. The PUC was all set to go ahead with a one-day cleanup of the charges against the companies filed by Rep Monroe Sweetland and others when G. W. Boqua of Springfield filed his amendment. This meant that Mountain States had 20 days to answer, pushing the hearing schedule back.

"We are virtually where we started from," Heltzel remarked at conclusion of a preliminary hearing April 2 on the Mountain States answers to Boqua and others who claimed the surcharges discriminatory because MSP was not required to levy surcharges in Springfield where a municipal system operates. Heltzel had just cleared the record to speed the hearings by overruling MSP's demurrers.

which led to the Public Utility Holding Company Act of 1935. Many states continue to require the extension of pre-emptive rights in the sale of stock by companies in those states.

SEC, however, has sponsored a streamlined limited pre-emptive rights provision which requires that the rights be retained except where the new stock issue is sold for cash through underwriters. Several states have adopted this method in regulating public utility corporations.

FPC Is Upheld

Court affirms commission's right to fix rates of power sold to federal agencies

The U. S. Supreme Court has affirmed the authority of the Federal Power Commission to fix the rates of electric power sold in interstate commerce to federal agencies for resale.

Decision was handed down recently in a case that had featured a jurisdictional dispute between the California Public Utilities Commission and FPC. Issue was whether the state commission or FPC should fix the rates on power which California Electric Power Co sold to a naval installation in Nevada and a county in that state.

Following up this decision, the Supreme Court last week refused to review five more cases raising the same issue. The action in one case clears the way for cuts in wholesale power rates to four Wisconsin cities and certain other customers supplied by the Wisconsin-Michigan Power Co, Milwaukee, Wis.

Similar cases involving FPC authority brought by California Electric Power and Wisconsin Power & Light Co were rejected the same time by the Supreme Court without comment.

FPC Steps In . . . The original California Electric Power case arose when it sought to apply a rate increase approved by the California commission to sales to these two customers. FPC stepped in ordering the company to show cause why its electric rates were not subject to exclusive regulation on these sales.

In upholding federal regulation in the case, an eight-member majority of

(*Continued on page* 222)

Today in Utility Finance

Yields (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1953									
April 9	**3.19**	**3.26**	**3.45**	**4.19**	**4.46**	**4.69**	**5.01**	**5.45**	**5.58**
April 2	3.17	3.25	3.41	4.17	4.46	4.70	5.04	5.37	5.54
END OF QTR.									
1st 1953	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
4th 1952	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
El Paso Electric	12	Feb.	$1,576,109	$1,469,494	$1.97	$1.84
Iowa Electric Light & Power	12	Feb.	2,242,167	1,997,219	1.71	1.49
Pacific Power & Light	12	Feb.	4,490,509	3,788,451	....	....
Southern Co, consolidated	12	Mar.	20,841,229	18,471,961	1.22(a)	1.15(a)
			1952	**1951**	**1952**	**1951**
Alabama Power	12	Dec.	$11,530,279	$11,100,178	$....	$....
Arizona Public Service	12	Dec.	3,319,000	2,163,000	1.38(b)	1.01(b)
Carolina Power & Light	12	Dec.	7,160,609	6,230,308	3.09(c)	2.95(c)
Community Public Service	12	Dec.	1,219,326	865,415	1.48	1.05
Empire District Electric	12	Dec.	1,384,421	1,139,961	2.27(e)	2.10
Idaho Power	12	Dec.	3,806,237	3,262,604	2.75	2.87
Jersey Central Power & Light	12	Dec.	3,567,842	2,560,554	....	....
Ohio Edison, consolidated	12	Dec.	16,191,000	13,887,000	2.97	2.60
Tampa Electric	12	Dec.	2,262,895	1,746,745	3.25(f)	2.92(f)
West Penn Electric, consolidated	12	Dec.	12,847,797	10,442,821	3.24(g)	2.96(g)
West Penn Power, consolidated	12	Dec.	9,735,193	8,397,505	....	....

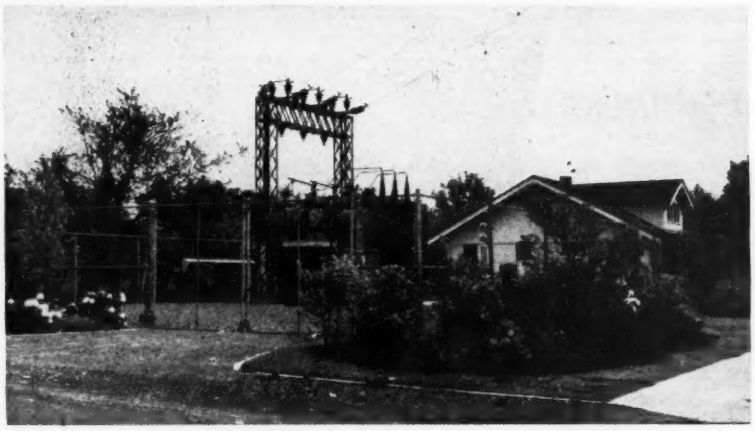
Notes—(a) Based on about 17,083,000 shares in 1953 and some 16,072,000 shares in 1952; (b) Based on 2,022,000 shares in 1952 and 1,622,000 shares in 1951; (c) Based on 1,950,000 shares in 1952 and 1,731,855 shares in 1951; (e) Based on average number of shares outstanding; (f) Based on 658,441 shares in 1952 and 598,441 shares in 1951; and (g) Based on 3,960,000 shares in 1952 and 3,520,000 shares in 1951.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF APRIL 9-15			
Bonds			
Texas Electric Service—1st mtg 3¼% due 1983	$7,000	102.00%	3.515%
Jersey Central Power & Light—1st mtg 3¾% due 1983	8,500	102.2058	3.875
Preferred Stock			
Texas Electric Service—100,000 sh $4.64 no par	$10,000	102.25%	4.538%
Common Stock			
Southern Co—1,004,869 sh (being offered to commonholders on 1-for-17 basis, record April 16 to expire May 7)	$14,068	$14.00	5.71%
Oklahoma Gas & Electric—241,195 sh (being offered commonholders on 1-for-10 basis, record April 16 to expire May 5, with an oversubscription privilege)	5,909	$24.50	6.12
SCHEDULE FOR APRIL-MAY			**Bid Date**
Bonds			
Blackstone Valley Gas & Electric—1st mtg due 1983	$5,800	.....	April 21
Detroit Edison—1st mtg due 1988	40,000	.....	April 28
Wisconsin Public Service—1st mtg due 1983	8,000	.....	May 5
Alabama Power—1st mtg due 1983	18,000	.....	May 12
New Orleans Public Service—1st mtg due 1983	6,000	.....	May 12
Central Power & Light—1st mtg due 1983	8,000	.....	May 18
Texas Power & Light—1st mtg	5,000	.....	May 18
Metropolitan Edison—1st mtg due 1983	8,000	.....	May 19
Pacific Gas & Electric—1st mtg due 1988	65,000	.....	May 19
Philadelphia Electric—1st mtg	30,000	.....	May 25
Debentures			
Montana Power—debentures due 1978	$18,000	.....	May 4
Preferred Stock			
Louisiana Power & Light—60,000 sh $100 par	$6,000	.....	April 21
Savannah Electric & Power—23,000 sh $100 par	2,300	.....	April 21*
Wisconsin Public Service—30,000 sh $100 par	3,000	.....	April 28
Long Island Lighting—100,000 sh $100 par	10,000	.....	May 6**
Philadelphia Electric	15,000	.....	May 12
Texas Power & Light	7,000	.....	May 18
Arkansas-Missouri Power—40,000 sh 5½% $25 par	1,000	.....	.....
Public Service of Indiana—600,000 sh $25 par	15,000	.....	.....
Common Stock			
Montana-Dakota Utilities—293,108 sh (to be offered commonholders on 1-for-5 basis)	$.....	.....	.....
Arkansas-Missouri Power—47,413 sh (being offered to commonholders on 1-for-8 basis record Mar. 31 to expire about May 5)	.....	.....	.....
New England Electric System—about 740,000 sh (to be offered commonholders on 1-for-10 basis)	.....	.....	.....
Public Service of Indiana—472,000 sh (to be offered commonholders on 1-for-8 basis)	.....	.....	.....

Notes—* To be offered by First Boston Corp group. ** To be offered by W. C. Langley & Co—Blyth & Co—First Boston group.

PUBLIC RELATIONS & ADVERTISING



A Garden Club Landscapes a Substation

Cooperation with a local garden club in substation landscaping is paying dividends in community good will for Portland General Electric Co. Not only does the group regard the substation as its very own, but also it has publicized the project nationally.

In a recent experiment, the company enlisted the aid of the Portland Garden Club to landscape Fairlawn distribution substation in Portland's residential area. In making the demonstration planting, the club was assured full company cooperation. Further, the company agreed to pay the group for planning and supervising planting by workmen.

After days of planning, the committee submitted and received approval of its plan. One thing the ladies insisted upon and were granted was good top soil in which to do the planting. In one day the substation was surrounded with pink dogwood, red oak, broadleaf evergreens, clematis armandii, and yew.

Garden club members are proud of their accomplishment. An article on the project by one member has appeared in the national "Garden Club of American Bulletin." All company substations, except those in remote or rural areas where landscaping is not required, have improved grounds. Eight permanent gardeners maintain these 86 landscaped substations the year around.

About 60% of landscaped substations have automatic lawn sprinkler systems which operate regularly in relays throughout the summer. Apparatus which controls automatic watering was developed and pioneered by the company. Compliments and favorable comments from neighbors on landscaped substations indicate this careful planning pays off.

Annual Reports Comments

Atlantic City Electric Co—The cover gains extra attention because of its simplicity and attractive color (red). The same color is used with skill throughout the book, and typography is excellent.

Central Illinois Light Co—On cover 1953, 1954, and 1955 peek out from behind the year of the report, 1952. Theme is that the company is planning for the future.

Cleveland Electric Illuminating Co—A good centerspread covers "10 Years of Progress."

Consumers Power Co—Three pages of charts on its operations are entitled "Graphic Story of Expansion."

Dayton Power & Light Co—A colorful report with good pictures, it devotes three pages to "Our DP&L Employees." Good ten-year tables are included.

Florida Power Corp—Charts depicting "Ten Years of Progress" show that kwhr sales have risen 342%, electric revenues 279%, customers 145%, and peak 339%.

Florida Power & Light Co—This report includes a two-page spread, "Highlights of Another Busy and Productive Year."

Indianapolis Power & Light Co—Two pages of comparative electric statistics for a ten-year period will interest analysts.

Kansas City Power & Light Co—Thomas Hart Benton, noted American artist, did the cover painting. A company lineman was the model.

Long Island Lighting Co—A "Credo" of the company, apparently publicized for the first time, opens the book. Report plays up the rapid growth of the company.

Louisville Gas & Electric Co—The centerspread presents photos of "Some of Our Growing, New, and Future Customers."

Oklahoma Gas & Electric Co—Opening pages show "Ten Years in Review" on left and " '52 in Review" on right—a good idea for a company just breaking away from a holding company. A simple map of operations carries the title, "50 Years of Achievement."

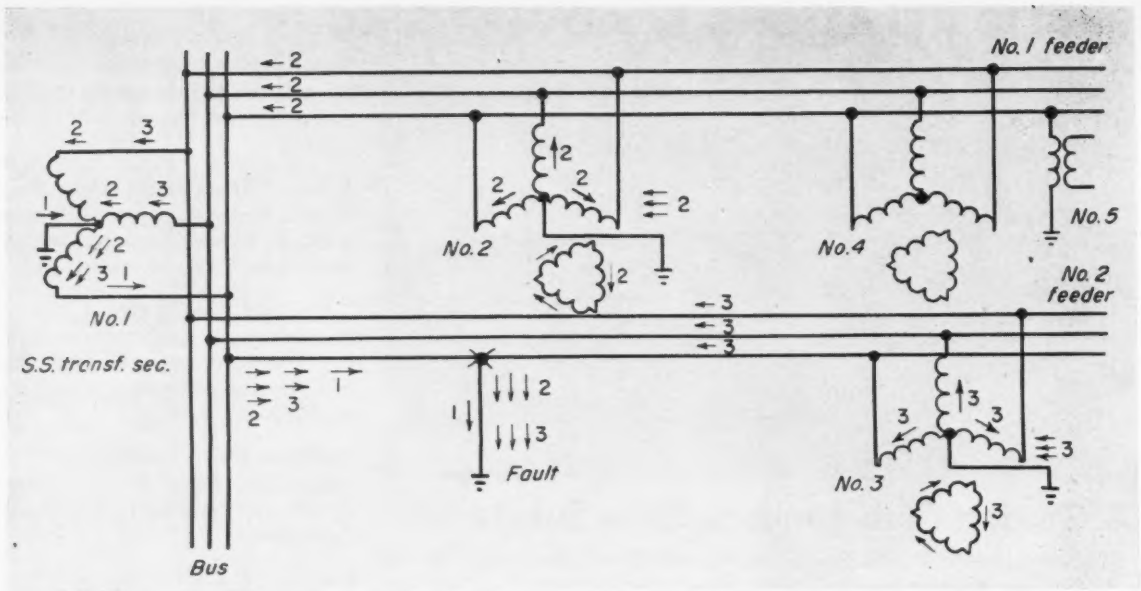
San Diego Gas & Electric Co—Report is colorful from cover to cover. A chart shows "Investment in Plant, Property, and Equipment." Theme, "The fastest-growing large city in the U.S.A.," gets emphasis.

AD COPY THEMES

Metropolitan Edison Co—Company took advantage of a recent sleet storm to supply copy for ads in area affected. The ads contained some superior pictures of conditions on system lines, damage to facilities, and of employees at work restoring service. Copy told of the efforts being made to restore service and explained exactly what had happened.

Northern States Power Co—"I Baked a $25,000 Cookie thanks to the accuracy of my electric range." The ad is a testimonial by Mrs Peter S. Harlib, Chicago, winner of the last Pillsbury national baking contest.

Southern Co—"Picture your business in Southern City, U. S. A." This is one of a series of ads telling of the industrial advantages of the Southern Co area. Illustration is the large face of a man. Superimposed on his forehead is a modern industrial plant.



GROUND FAULT CURRENT is contributed by several sources on system. Numbered arrows indicate paths of current components from the grounded transformers at the substation and Locations 2 and 3. Note that Bank 4 produces no current because its neutral has been isolated

Isolating Neutral of Y-Delta Transformers Prevents . . .

. . . Sympathetic Tripping of Feeders

Idaho Power Co discovers trouble occurs only when there is a combination of three-phase, grounded-wye-delta distribution banks and analyzes the conditions that cause it

PAUL A. OAKES, Engineer, Engineering & Planning Dept, Idaho Power Co, Boise

Sympathetic tripping of one or more unfaulted feeders following a phase-to-ground feeder fault can be eliminated by isolating the neutral of the offending transformer. This has been proved by Idaho Power Co where such trouble has been a major source of annoyance. Other companies also have experienced the same difficulty where they have a combination of three-phase, grounded-wye-delta distribution banks.

Idaho Power had a number of such installations. Sympathetic tripping was experienced on the system at six substations supplying 44 radial feeders of the 12.5-kv class. Not all feeders were involved, nor is it known how often this unintentional tripping occurred. However, considerable time was spent in switchboard testing before the cause was identified as fault current contributed by grounded transformer banks on unfaulted feeders.

Qualitative Explanation . . . For ground faults to cause sympathetic tripping, these conditions must be present:

1. Distribution system must be grounded-wye.

2. Ground sources must exist on the distribution system outside the substation. Only important ground sources are three-phase, three-transformer distribution banks connected grounded-wye on the high side and delta on the low. Open wye-open delta, delta-delta, open-delta, or single-phase banks do not constitute ground sources.

3. In general, feeder protective relays at the substation must be the instantaneous type. It is possible but uncommon for sympathetic tripping to occur at stations having induction relays for feeder protection.

Banks of three-phase distribution transformers connected grounded-wye on the high side and delta on the low, hereafter called grounded-wye-delta banks, act as grounding transformers. Grounding transformers attempt to balance the three-phase voltage during a phase-to-ground fault by drawing current from the other phases.

Generally the substation transformer supplies ground fault current. But if other ground sources exist, such as grounded-wye-delta banks, they too will supply ground fault current. Amount of current depends upon impedance of each ground source and impedance from the fault to each grounding transformer. At most substations, the substation transformer acts as its own grounding transformer, however, and supplies a large part of the line-to-ground fault current.

How Current Flows . . . Effect of a ground fault is shown above for an elementary distribution system consisting of a substation transformer, two feeders, and several distribution trans-

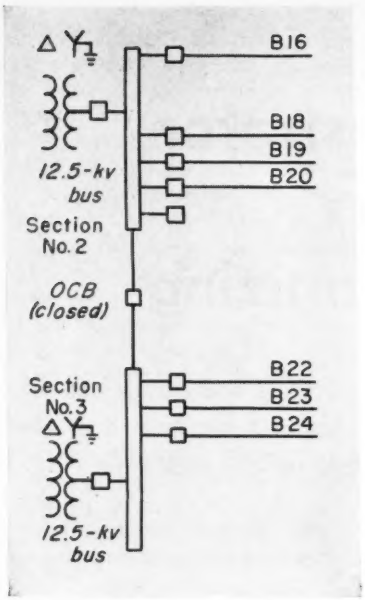


DIAGRAM of Boise 12.5-kv distribution is analyzed in terms of symmetrical components

Calculations and Tests Show How Fault Current Is Distributed

Location	Capacity Acting as Ground Source, Kva	Percent Impedance	Equivalent Reactance, ohms	Calculated		Fault Tests Feeder 18	Fault Tests Feeder 22
				Amp	Percent of Total	Percent of Total	Percent of Total
69-Kv bus	370,000	...	0.422				
Substation transformers	20,000	7.4	0.58	6540	73.5	76	76
B-16	47.5	3.0	98	39	0.42	*	*
B-18	390	3.0	12	332	3.58	Fault	3.8
B-19	344.5	3.0	13.5	295	3.18	3.8	4.3
B-20	1,119	3.0	3.3	1206	13.00	6.5	7.2
B-22	74	3.0	63	62	0.66	*	Fault
B-23	None	...	.....	0	0.0	*	*
B-24	612	3.0	7.6	526	5.66	4.2	4.8
Total fault current	.....	...	.....	8900	100	.....	.....

* Negligible amount

formers. Numbered arrows denote the direction and source of current being supplied to the fault. For simplicity load currents are omitted. Note that it makes no difference whether a ground source is located on a feeder or at the substation. Direction of current which ground source supplies is such that it contributes to total fault current.

If current in the unfaulted feeder is large enough, the line will trip, going through exactly the same tripping sequence as the faulted feeder. If the faulted feeder recloses successfully, so will the other feeder; if the faulted feeder locks out, so will the unfaulted.

Fault Analysis . . . Technique of symmetrical components may be employed conveniently to determine the magnitude of the several currents involved. Qualitative nature of sympathetic tripping is easily explained by symmetrical components also, but an understanding of this method is necessary if the analysis is to be at all convincing.

For this analysis the Boise 12.5-kv overhead distribution system will be used. An elementary single-line diagram of the system is shown. Some simplification has been made to facilitate calculation. First, all loads, resistance, and feeder line reactances are neglected. Second, three-phase distribution transformer capacity is lumped together on each feeder. Third, effect of common neutrals and feeder paralleling is neglected.

Analysis will be made for a single line-to-ground fault near the substation bus. Positive, negative and zero sequence currents are equal to each other and to the normal line-to-ground voltage divided by the sum of the positive, negative, and zero sequence impedances. Total fault current is equal to the sum of positive, negative, and zero sequence currents. It divides among the several ground sources according to the inverse ratio of their impedances.

Calculations give maximum available fault current, although total fault current may be less depending upon fault location, arc resistance, etc. However, distribution of fault current is determined primarily by the zero-sequence network.

Calculated distribution of fault current is summarized in the table along with the actual distribution determined from oscillographic records of two line-to-ground faults. While experimental values from oscillographic records do not exactly match calculated results, agreement in general definitely supports the calculations and theory upon which they are based.

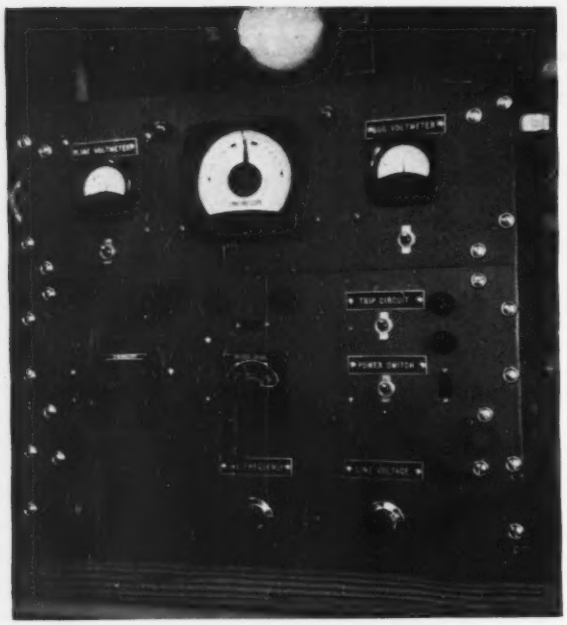
Cures for Sympathetic Tripping . . . Of two methods to eliminate sympathetic tripping, one is to apply directional elements to phase and ground relays of all feeders subject to the condition. The other and more certain way is to isolate the wye point on all three-phase distribution transformer banks.

It has been common practice on Idaho Power Co's system to float these wye points when three transformers of the same capacity are banked. Probably enough neutrals can be floated that only the ground relays need be directional.

However, this simple solution prompts the question of whether the wye points of all wye-delta, three-phase distribution banks may be floated. If the load on such a transformer bank is balanced three-phase, it is obvious the neutral may be floated. In the case of single-phase load being taken from one transformer in the bank, it is necessary to determine what the resulting kva loading of each transformer will be.

Floating the neutral reduces the loading on the transformer serving the single-phase load and increases the loading on the other two. With capacity ratios of the single-phase transformer to the other two greater than 2:1, it is not practical to float the neutral. Capacity of the single-phase transformer cannot be utilized in excess of twice the rating of the smaller transformers without overloading them. But when all three transformers are of equal impedance, floating the neutral does not affect the loading of the transformers.

Another question which may be prompted is the amount of unbalance resulting from single-phase loading of floating wye-delta banks. In general, if transformers are not overloaded excessively, voltage unbalance actually is no worse than if the neutrals were tied in.

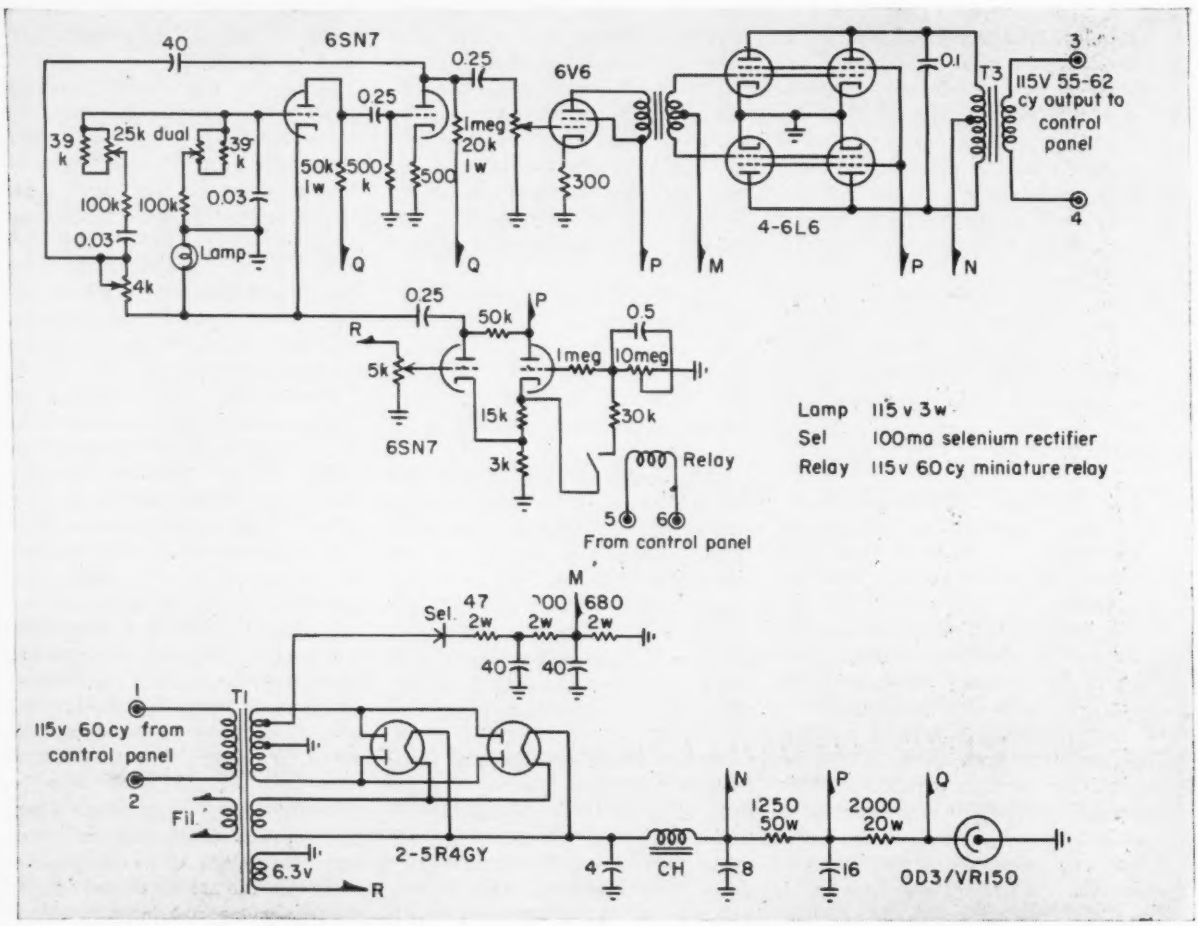


DEMONSTRATOR OPERATES on 110 vac and uses an ordinary plate supply power transformer which provides adjustable output to 120 volts

Demonstrator Teaches Synchronizing

Shows tyro operators and servicemen how to parallel machines with breakers and what happens when wrong actions are taken

E. M. HUMPHRIES, Communications Engineer, Southwestern Gas & Electric Co, Shreveport, La.



LINE VOLTAGE IS SUPPLIED to the control panel of the demonstrator through an amplifier driven by a Wein bridge oscillator which was selected for its simplicity, good wave form, stability, and relative freedom from lock-in tendency. The 150-ohm resistor limits current

A portable synchronism demonstrator is teaching substation operators and servicemen of Southwestern Gas & Electric Co the mechanics of synchronizing circuit breakers. The device enables the men to practice their daily work assignments without fear of mistakes causing service interruptions. It also gives them a better understanding of their daily operating instructions and how best to carry them out.

The demonstrator does everything a bus, breaker, or line will do. Circuits are similar to those of a standard switchboard. The synchroscope and line voltmeter are energized through the synchronizing switch. The breaker cannot be closed by hand until this switch is on. If closed out-of-phase or when the synchroscope is rotating too fast, the breaker trips and a buzzer sounds.

The breaker also trips if the line voltage jack is shorted. If the breaker control switch shows a "red flag," the breaker can be closed by an external reclosing relay or synchronism check relay. The synchroscope can be stopped in any position, and a frequency difference of one cps is easily accomplished.

To make the electronic generator pull in when connected to the bus, or fail to lock if the slip frequency is too great, a Wein bridge oscillator is used, giving a frequency range from 55 to 62 cps. A supply frequency voltage of the proper phase is connected to the grid of the left triode section of the lower 6SN7. The plate of this section is coupled to the Wein bridge cathode, but plate current is cut off by the cathode bias in the right section of the 6SN7. Closing the breaker opens the relay, allowing the 0.5 mfd capacitor to discharge, and synchronizing voltage is supplied to the oscillator cathode.

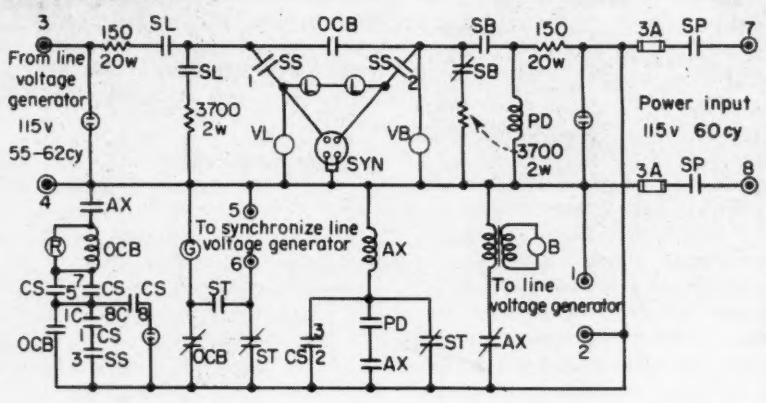
The synchronizing circuit is adjusted first by turning the two controls to zero resistance and blocking the relay contacts open. The frequency control is then set so the synchroscope rotates at the maximum speed at which it is desired to allow synchronizing to occur. Increasing the 5,000-ohm control setting causes the oscillator to lock in with the supply frequency. The blocking is then removed from the relay contact. The breaker is closed and opened, each time increasing the 10-megohm control setting until the point is reached where the relay potential difference just trips the breaker before the oscillator locks in. The minimum practical settings cause the breaker to trip if it is closed when the frequency difference is more than approximately three cycles per minute.

The line voltage generator is built on a 13x17x3-in. chassis bolted to the front panel. Eight conductors connect the chassis to the front panel. All leads that connect together frequency-determining components are shielded, and the plate supply is well regulated; therefore, there is no detectable tendency for the oscillator to lock in with the power supply frequency.

Bus voltage is supplied from power circuit through fuses and a main power switch. Line voltage is supplied to the control panel from the electronic generator and reaches the breaker OCB through a resistor and a line cut-off switch similar to those on the bus side. The toggle switch in the OCB trip circuit cuts out the protective relay. Opening this switch keeps electronic voltage generator from locking into synchronism after the breaker closes. Therefore, out-of-step conditions may be shown much as they occur in practice.

Line and bus voltmeters oscillate back and forth from zero to 115 v as the two sources rotate with respect to each other. If the breaker trips, the alarm is sounded. Buzzer is reset by opening the trip circuit switch or by turning the breaker control switch to the trip position.

Line voltage frequency range is from 55 to 62 cps. When the line is running at 55 cps, the synchroscope will not rotate but will oscillate back and forth while the synchronizing lamps flicker. This is a desirable lower frequency limit since the condition is sometimes encountered when systems are out of synchronism.



CS	Control switch
VL VB	Line and bus voltmeter
R G	Breaker indicating lamps
SS	Synchronizing switch
SYN	Synchroscope
OCB	Circuit breaker
PD	Protective device
AX	Auxiliary tripping relay
L	Synchronizing lamps 115v 3w clear
B	Alarm. Edwards dixie buzzer
SB	Bus voltage switch. spdt toggle
SL	Line voltage switch. spdt toggle
ST	Trip circuit switch. dpdt toggle
SP	Power switch. dpst toggle

Control switch development

Contacts		Positions			
		Close	Normal after close	Normal after trip	Trip
1–2	1	X			
	2				X
3–4	3	X			X
	4	X			
5–6	5		X	X	
	6				
7–8	7	X	X		
	8	X	X		

Note: Relays and switches shown deenergized or in the open position

and allows the bus voltage to change with line. Relay PD acts as undervoltage relay to trip the breaker. When bus is deenergized, 3,700-ohm resistor brings synchroscope to 12 o'clock

Plant Economy Starts at the Turbo-

Lower overall cost per kwhr can be achieved by decreasing investment per kw and cutting operating expense

To Cut Costs:

- **Choose largest feasible unit**
- **Keep plant in efficient operating condition**
- **Use lowest acceptable SCR**
- **Evaluate over-size generator for system kvar supply**
- **Simplify station design**
- **Consider outdoor turbo-generator installation**
- **Select optimum steam pressure and temperature**
- **Schedule construction efficiently**

EDWIN H. KRIEG*, Consulting Engineer, Stone & Webster Engineering Corp, Boston, Mass.

Can one reduce the first cost of a power plant by way of the turbine generator? If various manufacturers quote about the same price for a unit of the required size, then the cost of the turbine generator appears to be settled. Nevertheless, the possibility of making some economies does exist. These should be aimed not only at reducing the first cost of plant but also toward the larger objective of lowering the overall cost of power generation.

If the total dollar cost of a turbine generator cannot be reduced, the problem becomes one of decreasing cost per kilowatt, as well as lowering fuel, maintenance and labor costs, while increasing availability or kilowatt-hours obtainable each year from a kilowatt of capacity thus obtaining the lowest overall cost of a kilowatt-year.

If the total cost of a turbine generator cannot be reduced materially, the cost per kilowatt may be decreased if its output can be increased, although other benefits may be sacrificed. The ideal would be to utilize maximum guaranteed capability to the full, by closely balancing the respective outputs of turbine, boiler and auxiliaries.

Size of Turbines . . . Obviously, if the total cost of a plant can be divided by a larger turbine-generator capacity, the cost per kilowatt will be less, and most systems are now using larger and larger turbine generators.

The effect of size on turbine-generator costs is illustrated below:

Cost per Kw Capability

Size Mw	Psi	F	Dollars (Approx)
16.5	850	900	33
100.	1,450	1,000	21
100.	1,450	1,000/1,000	23

Almost all engineers realize that larger units mean lower first cost as well as lower fuel, labor, and maintenance costs.

Assuming that as large a unit as is economic has been selected, even its "capacity" may have various meanings: "name plate" rating and maximum guaranteed capability being the more important. In the existing ASME-AIEE Preferred Turbine Standards, turbine-generator or "name plate" rating means either 11.5, 15, 20, 30, 40, 60 or 90 Mw. These units have guaranteed capabilities[1] of 12.65, 16.5, 22, 33, 44, 66 or 99 Mw. It is most pleasing to report that the new Standard, already revised by the ASME Committee and soon to be approved[2], completely abandons "name plate" rating and will give only guaranteed capabilities. Designing the entire plant based on the "maximum guaranteed" rather than on "name plate" capacity, reduces cost per kilowatt by about 10%.

Condensing turbines other than "Preferred Standard" units have "name plate" ratings corresponding to 0.90 power factor on the generator, but the "guaranteed" capability is 25% larger to match the generator capacity at 1.00 power factor. It is safe to design all plant components to match the maximum guaranteed capability of the turbine generator. But even this term may have some "stretch", as is shown below.

If the sole objective is lower first cost per kilowatt, then more than the maximum "guaranteed" capability may be obtained from a given size of turbine. For example:

1. The top bleed heater may be omitted, or shut off during high loads; this increases capability about 4%, but cycle efficiency decreases thus increasing fuel cost. Larger boiler capacity is needed.

2. Turbines are designed to give full capability at 2.5 in. Hg but have greater capability at lower back pressure; e.g., a 1,250-psi, 950 F turbine has 1.2% more capability at 2-in. Hg back pressure, 2% at 1.5 in., and 2.6% at 1 in.

Summarizing the above:

	Percent Gain
1. Shutting off top bleed point	4
2. When operating at 1 in. instead of 2½ in. Hg, about	2.6
Total	**6.6**

To gain capability some operators run "wide open," beyond the guaranteed capability, but this cuts into the factor of safety provided by the manufacturer for such contingencies as deposits and manufacturing tolerances. The economics of "trading" maintenance or possible turbine-generator damage for lower first cost per kilowatt is a function of operating experience.

Equipment Condition . . . It is also essential to avoid sacrificing guaranteed maximum capability by not keeping turbine generators and auxiliaries in excellent condition. To preclude losing turbine generator capability:

1. Keep the turbine clean, free from deposits that reduce orifice area, steam flow, and capacity.

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* Article adapted from paper presented at ASME annual meeting, New York, December 1952.

[1] At 2.5 in. Hg back pressure, full extraction for feed heating.

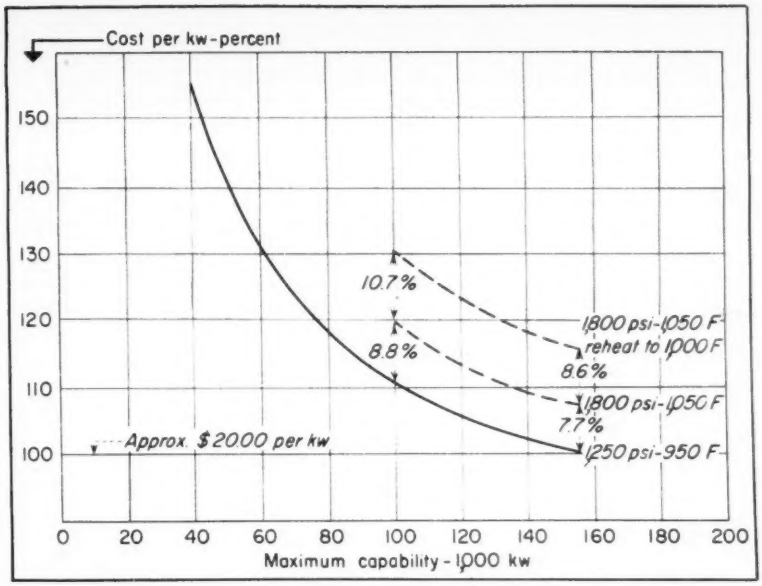
[2] Now available: ASME Standard 100, AIEE No. 601-602 dated Jan. 15, 1953.

2. Keep shaft packings or dummy strips in good condition so there is less internal leakage. Check gland or dummy leakage constantly.

3. Keep condensing equipment clean. If the plant has cooling towers, maintain proper Langelier ratio of the cooling water so vacuum does not decrease, especially during higher summer temperatures.

4. Operate with higher hydrogen pressure in generator to insure keeping it cool.

5. Use larger hydrogen coolers, good for 95 F cooling water instead of 85 F.



LARGEST FEASIBLE RATING offsets the additional cost of high-pressure, higher temperature, and reheat units. These data for a 3,600-rpm turbine-generator unit have been derived from a paper by McClure and Mellor in the February, 1952, issue of "Electrical Engineering"

Effect of Short Circuit Ratio . . . Some economy in power plant investment may be realized through industry acceptance of lower short-circuit ratios for generators. To exemplify the cost effect of short-circuit ratio, the savings possible in going from 0.9 to 0.8 SCR may approximate:

Mw	Dollars
25	6,500
50	13,500
100	34,000

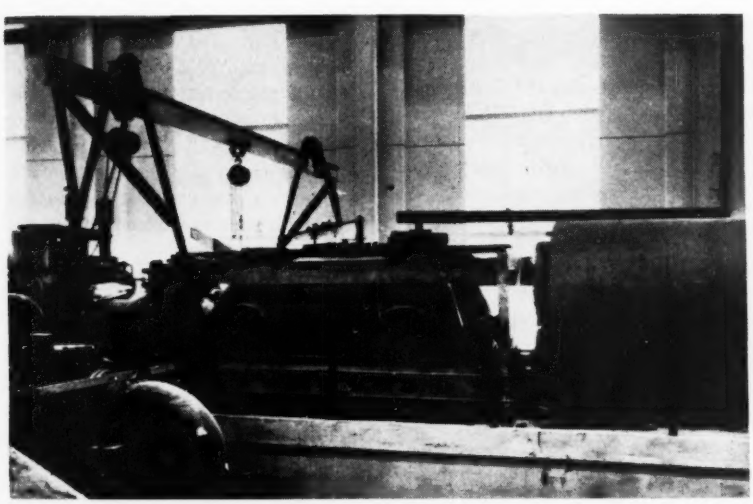
Because the definition of short circuit ratio is arbitrary [1], this term has value more as an indication of the relation between physical size and rating and of stability performance. The importance of short circuit ratio on steady state stability depends on the nature of the load and the type of excitation system. A widely fluctuating load requires a higher short-circuit ratio. When manual control of the field current is used, a high short-circuit ratio is relatively important, but with automatic field current control, the exact value of short-circuit ratio is relatively unimportant.[2]

For a given change in load (stator current) the generator with low short-circuit ratio requires a more rapid and larger change in field current (excitation). If a turbine generator is connected to the system through only two circuits, it will be less stable than one connected through four circuits. Consequently, as the system grows and there are more connections between a given machine and the remainder of the system, stability will be maintained with lower values of short-circuit ratio.

In "Low Short-Circuit Ratio is Practical for Today's Turbine Generators," [3] Messrs. Crary and McClure show that reducing the short-circuit ratio from 0.9 to 0.5 would permit obtaining 20 to 25% more kilovolt-amperes from the same frame size, using modern generator voltage regulators. Total generator losses would be reduced by approximately 10 percent, and stability would not be sacrificed.

Ability to put more kilovolt-amperes into a given frame size or, conversely, to use a smaller frame size for a given kilovolt-ampere capacity will reduce generator cost and accordingly reflect lower prices.

Kilovar Capacity . . . If a system needs additional kilovar capacity, it may often be much more economical



GANTRY CRANES supplement the station crane during the erection of the turbine generator in the Redondo Station of Southern California Edison Co. Use of such cranes reduces costs

[1] It is defined as the field current at full voltage and no load, divided by the field current to circulate full load stator current with the stator short-circuited.
[2] "The Significance of Generator Short-Circuit Ratio," C. M. Laffoon, Westinghouse Engineer, p. 207, November, 1952.
[3] "Low Short-Circuit Ratio is Practical for Today's Turbine Generators," Crary, S. B., and McClure, J. B.; Electrical World, June 30, 1952, pp. 65-69.

to get it by an over-size generator than by synchronous condensers. Some utilities gain the same objective by placing a house generator on the main shaft, using some of the excess generator capacity thus obtained for kilovar capacity.

Double or Triple Flow Exhausts . . . In some turbine sizes, a choice is possible as to number of exhaust flows; e.g., in sizes of 125 and 150 Mw, turbines may be obtained with triple or quadruple exhaust flows. Low first cost would require the lesser number of flows although high fuel cost and load factor may make the more expensive turbine the more economic. The cost of the extra "flow" in a 125-Mw turbine may exceed $200,000.

Tandem vs Cross Compound Turbines . . . Tandem 3,600-rpm turbine generators cost less than cross compound turbines, whether the latter have 3,600 or 1,800-rpm low pressure elements. As in the case of multi-flow units, the higher fuel economy of cross-compound turbines, which reached 300 Btu per kwhr in some sizes, sometimes outweighs the higher first cost.

Designing for Low Cost . . . Investment in engineering (especially in the early stages of a job) is often more economical than saving on engineering and designing "like the last job," unless speed is of more than usual concern. Too frequently, authorization of the job is late, giving insufficient time for economic studies. This requires placing engineers with mature judgment on the job to insure proper economy. More drawings mean less construction cost; fewer drawings leave more work to field construction or the manufacturer. The latter is usually the more costly procedure even though engineering cost may be apparently lower.

Design Features for Low Cost . . . Use a simplified turbine lead with few or no forgings or castings and a minimum of bends.

Omit the gate valve in main steam lead of unit type installations.

Use simplified generator leads: Short and direct to transformers, bare when outdoors, no low tension switching.

Use higher generator voltages of 16, 18 or 20 kv especially for larger units.

Approve manufacturers' blueprints faster, minimize changes, avoid right and left hand arrangements by keeping same hand, especially for auxiliaries. This will also keep down investment in spare parts.

Some engineers believe that (a) side exhaust openings on a turbine or (b) placing two condensers on either side of a bottom exhaust turbine saves sufficient foundation cost to warrant the extra cost of the side exhaust or the tee connection for Type b. The economy of doing so has not been clearly demonstrated as yet.

Increased hydrogen can be used to permit carrying higher loads.[1]

Support Turbine Generator on Condenser . . . This scheme to save foundation cost has been tried in about three small or moderately sized units, but the amount of investment saved has not yet been clearly demonstrated. Most engineers think there is in sufficient economy. The thought of reducing foundation cost by using the bottom half of the low pressure turbine casing as a beam to carry some or all of the load has already been expressed.[2]

Outdoor Turbine Generators . . . Economies have been made in omitting building enclosures over turbine generators especially in warmer, but also in cold, climates. Investment saving must be balanced against longer outages of the unit if inclement weather exists at that time.

Selection of Proper Pressure and Temperature Group . . . Entirely aside from cycle considerations, advantage should be taken to select the optimum pressure and temperature. Prices are normally the same within the following pressure blocks so it is usually advantageous to use the highest pressure in the block rather than an intermediate pressure:

250-400	851-1,450*
401-600	1,451-1,800
601-850	1,801-2,400

(* a 1,250 psi turbine costs the same as for 1,450 psi)

Use proper temperature rating. Prices are normally the same within following blocks (not all these temperature blocks are available for the above pressure blocks); it is generally more economical to use the highest temperature in the block:

up to 750	901-950
751-825	951-1,000
826-900	1,001-1,050

Effect of Power Factor on Cost . . . The cost of an 80% power factor generator is higher than one for 85% by the following approximate amounts:

Mw	Total Dollars
25	10,000
50	21,300
100	45,000

Effect of Speed on Cost . . . In some turbine sizes, either 1,800 or 3,600 rpm, tandem-compound types may be selected, the 3,600 rpm units always having lower first cost. In the case of a 100-Mw unit, an 1,800 rpm unit costs about $160,000 more than a 3,600 rpm.

Erecting for Low Cost . . . If several units can be installed in sequence, men become better trained; and those having superior aptitudes may be retained.

Use of two hooks on the main crane instead of one, say two 75-ton rather than one-150 ton hook, greatly speeds erection as well as maintenance.

Use of 2 or 3-ton erection gantrys appreciably decreases erection cost. These were used by Stone & Webster Engineering Corp. at Redondo plant of Southern California Edison Co in 1947.

Avoid overtime. Schedule construction.

Help the erection crew with good facilities, such as a movable tool crib, and by getting platforms, stairs, and gratings in place early. Keep the job "clean".

Faster erection results not only in a saving in first cost but also in fuel cost when the more efficient plant goes into service earlier.

Release the crane by getting condenser erected before turbine arrives so both erectors won't need crane and other such erection facilities simultaneously.

The manufacturer usually does his best to arrange for progressive shipments from factory, e.g., soleplates, oil tanks, etc. Keep in constant contact with the construction superintendent as to his needs.

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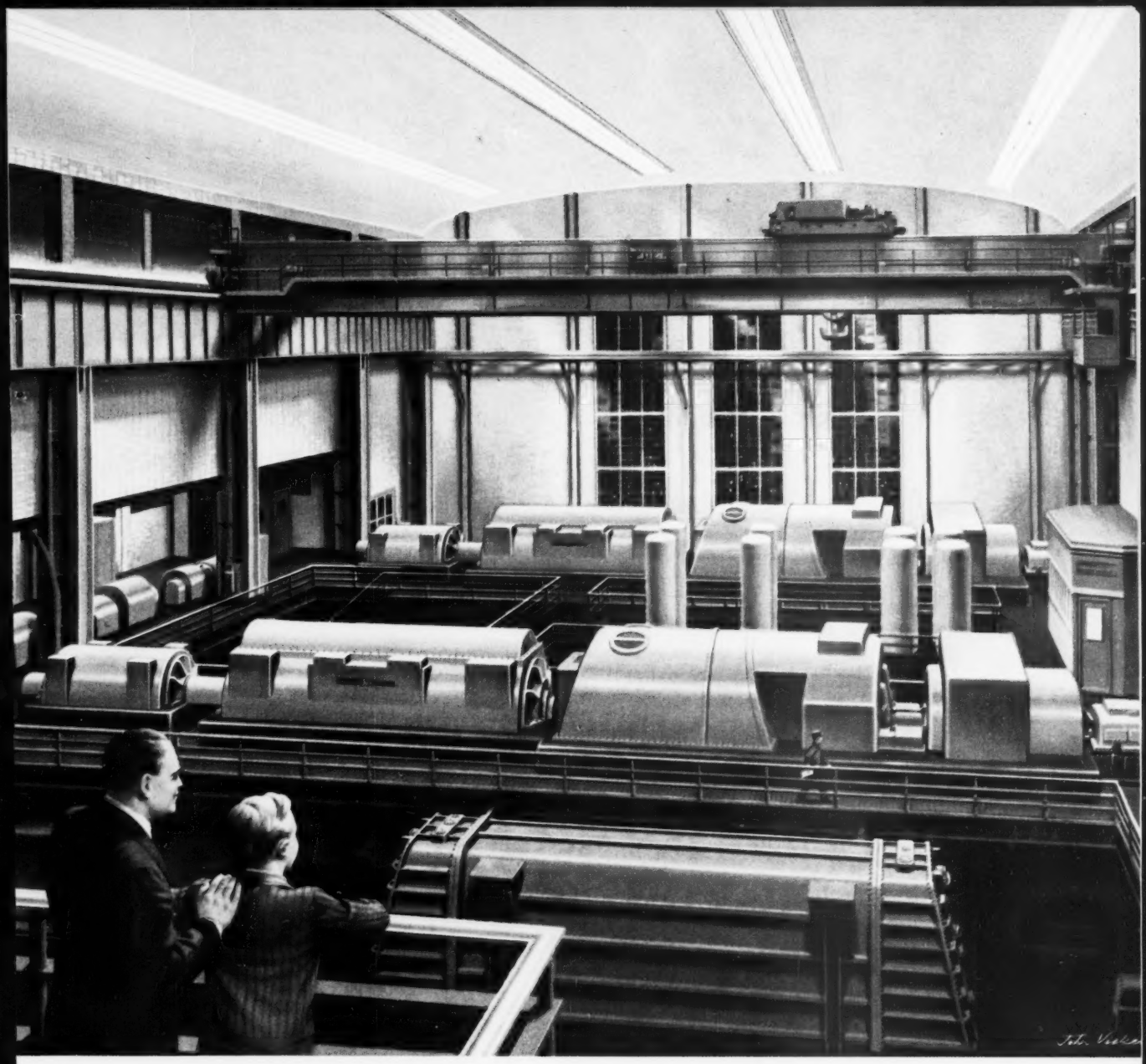
[1] "Loading of Hydrogen Cooled Generators at Elevated Gas Pressures," D. S. Snell, AIEE Paper 50-30, January, 1950.

[2] Mechanical Engineering, July, 1952, p. 595.

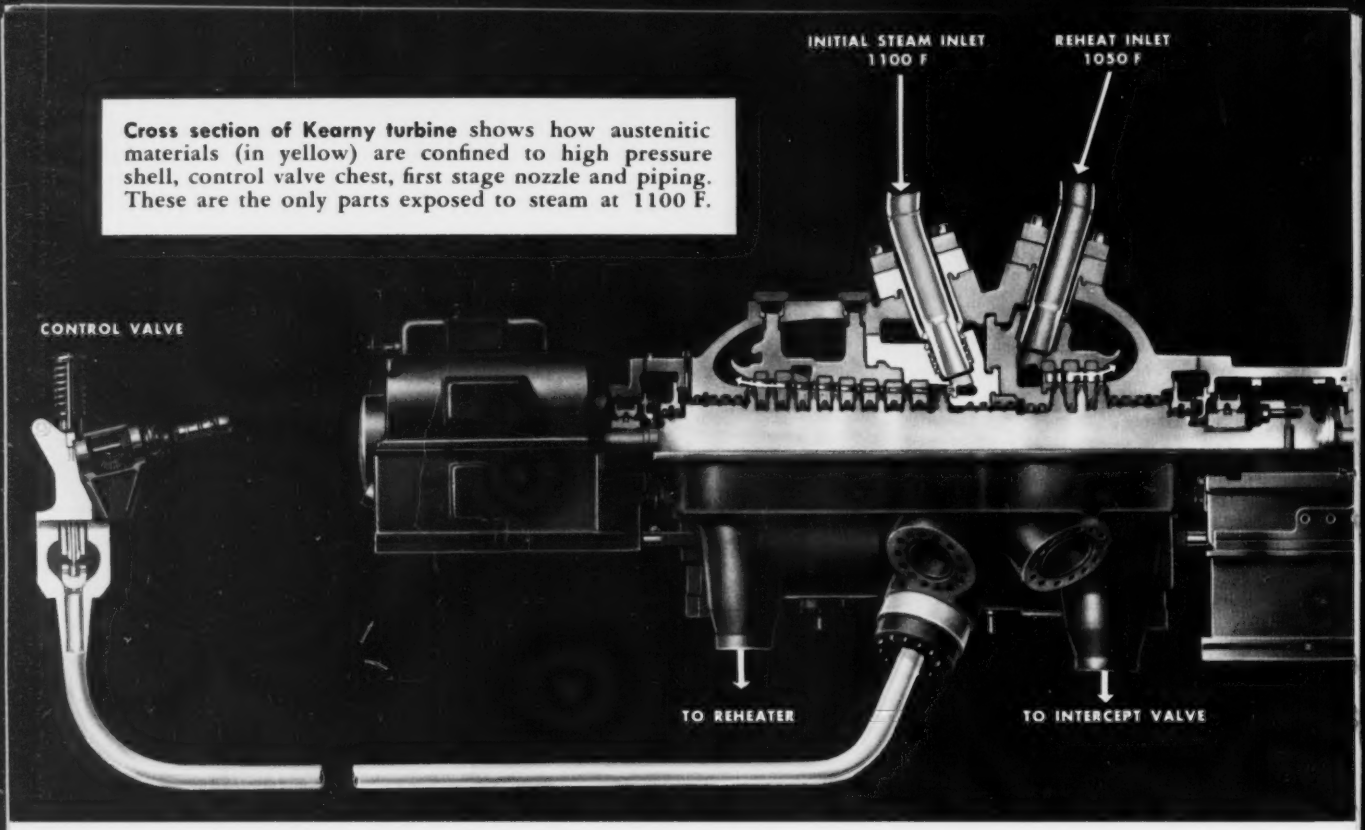


WORLD'S FIRST 1100F STEAM TURBINE INSTALLED AT KEARNY

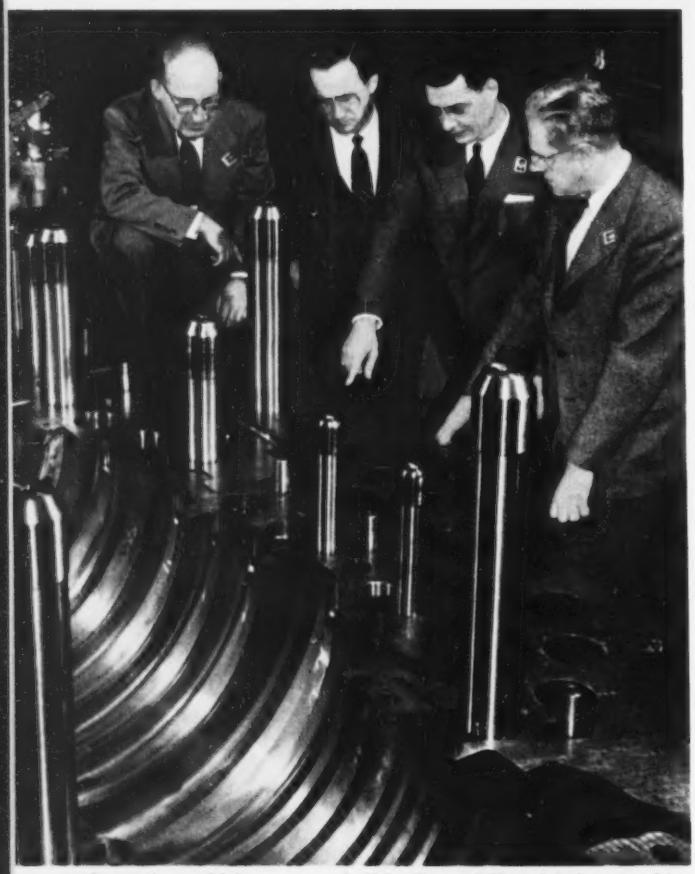
Two 145,000 kw General Electric steam turbine-generators at the new Kearny Station of Public Service Electric & Gas Company, New Jersey, will operate under the most advanced steam conditions for which turbines have ever been built.

GENERAL ELECTRIC

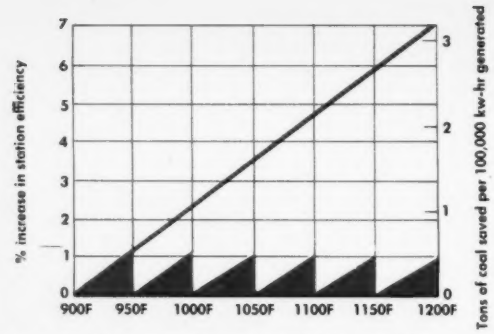
FOR DETAILS, TURN TO NEXT THREE PAGES . . .



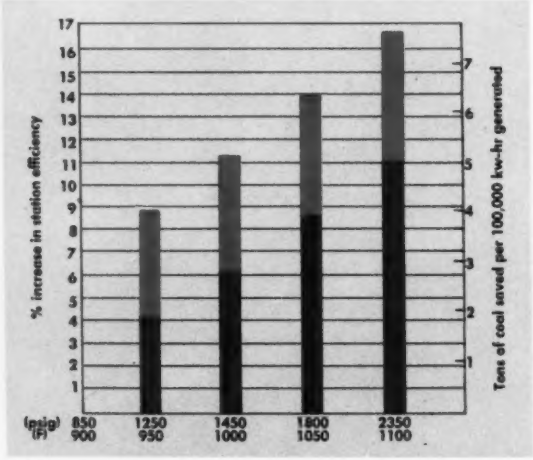
Cross section of Kearny turbine shows how austenitic materials (in yellow) are confined to high pressure shell, control valve chest, first stage nozzle and piping. These are the only parts exposed to steam at 1100 F.



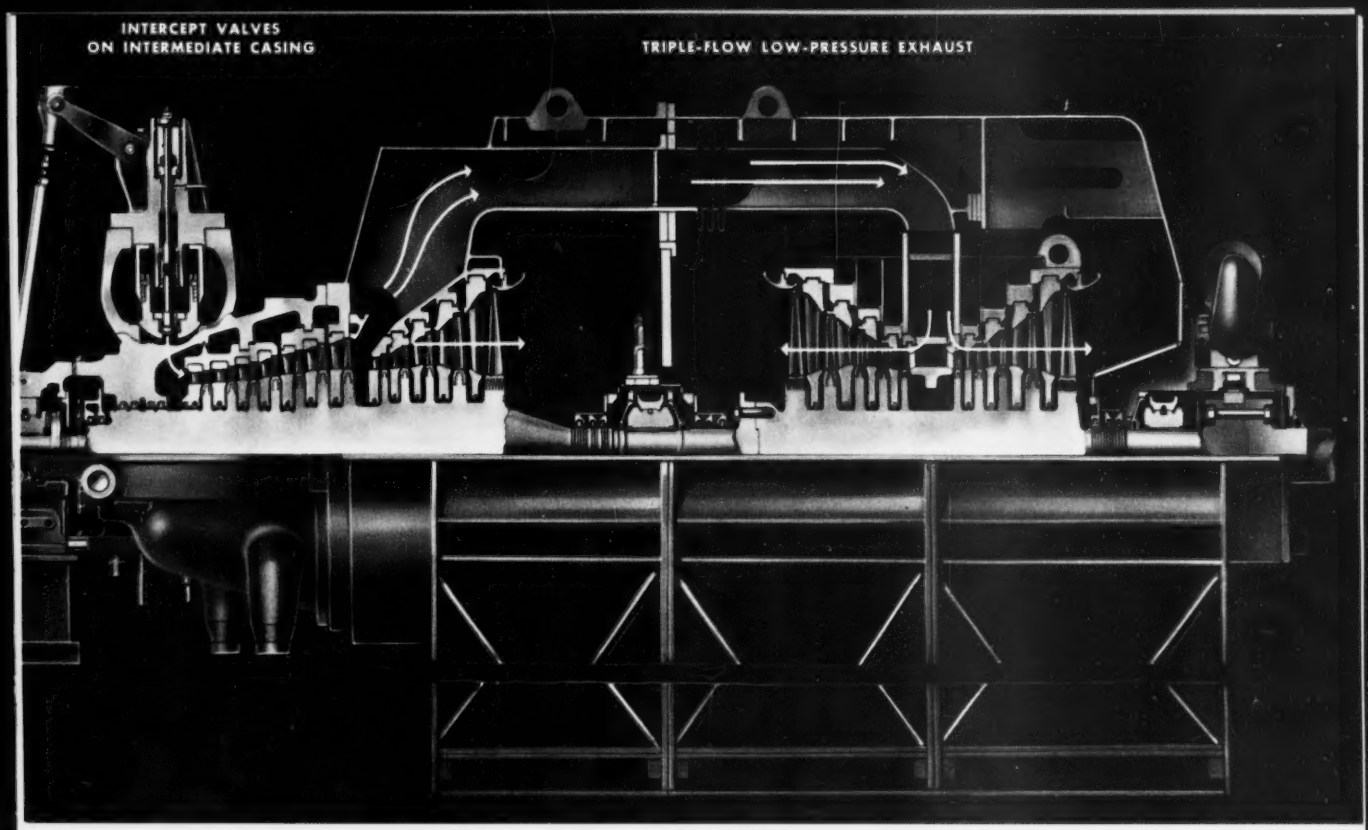
Inspecting a high-pressure shell in General Electric's large turbine and generator factory are C. W. Elston, Manager of Turbine Engineering; J. R. Casey, Manager of Marketing; C. Schabtach, Manager of Engineering; and W. Pruessman, Manager of Manufacturing.



Improved turbine efficiency with higher initial temperature at a given pressure level (1250 psig) is shown above.



Efficiency gains with higher temperature, pressure, and reheat are shown with 850 psig and 900 F used as a base. Black represents gains with improved initial conditions and red further gains with reheat to initial temperatures.



Higher-Temperature Reheat Cycle Improves Station Fuel Economy

General Electric Tandem-Compound, Triple-Flow Reheat Turbines Operate at Advanced Steam Conditions

The recent start-up of the world's first 1100 F steam turbine at the new Kearny Station marks an important step in engineering progress. Public Service Electric and Gas Company, first utility to install a 1050 F turbine, has again improved power cycle efficiency through the use of steam at higher temperature and pressure.

Two General Electric 145,000 kw reheat units, second of which is expected to go on the line later this year, have initial temperature of 1100 F, pressure of 2350 psig, and reheat temperature of 1050 F. They are also the first triple-flow units to employ a side discharge exhaust hood to permit a lower operating floor level.

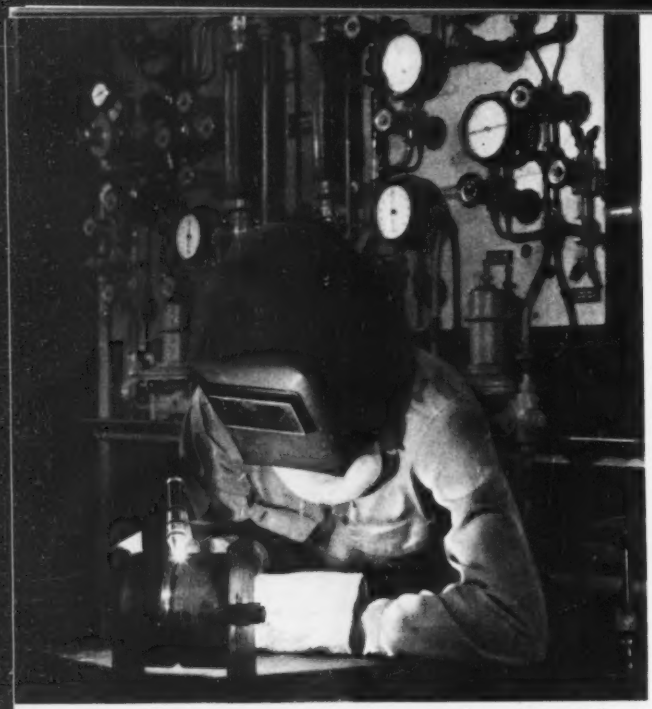
The use of these advanced steam conditions makes possible sharp reductions in generating costs. For any reheat turbine, it is estimated that an efficiency gain of better than one per cent can be obtained with each 50 F increase in both inlet and reheat temperatures. Increasing the initial pressure by 15% produces another one per cent gain in efficiency.

All indications point to a continuance of this trend. To General Electric turbine engineers a prediction of 1200 F machines by 1960 does not seem remote. However, the timing will depend upon the results of research in the field of metallurgy.

The Kearny turbines, with their forged austenitic inner shells, demonstrate the tremendous strides which have already been made. General Electric will continue to lead in extending the practical possibilities of higher-temperature, higher-pressure reheat turbines.

Leader in Turbine-Generator Progress

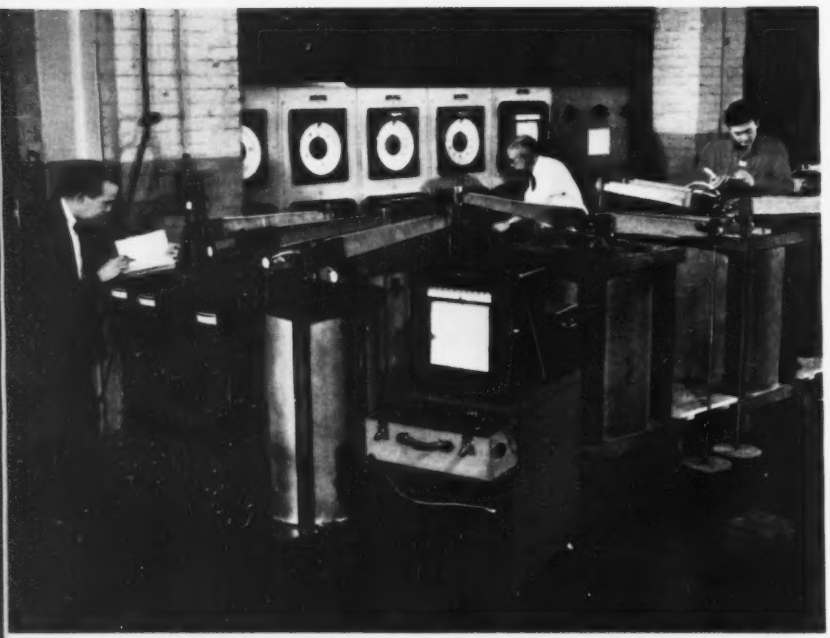
GENERAL ELECTRIC



Testing a new arc-welding procedure, this welder is joining austenitic steel pipes without the use of a backing ring, minimizing the chances of cracking.

X-ray diffraction equipment used in the G-E Turbine Laboratory reveals the nuclear structure of new alloys under development, helps determine their adaptability to high-temperature service.

General Electric Metallurgical Research Makes Possible Higher Turbine Operating Temperatures



In this laboratory creep test new metals are stressed for long periods of time in high-temperature furnaces. G-E engineers, by measuring the gradual stretching of the metals, can predict their suitability for use in turbine-generators.

An important path to increased turbine efficiency is the discovery of new materials capable of withstanding at high temperatures the stresses caused by high pressures.

To this end, General Electric research has been remarkably effective. One result has been the development of stronger ferritic steels for turbine shells, steam leads, and station piping. Another outgrowth of constant laboratory work is the refinement in processing techniques for austenitic steels which have always, by their nature, been difficult to cast, weld, and machine.

Determining the characteristics of new materials is just as much a part of General Electric turbine development as the creation of new turbine designs. This metallurgical research will continue to raise the limits of practical design to higher temperature levels for greater station operating efficiency.

1878 75 1953
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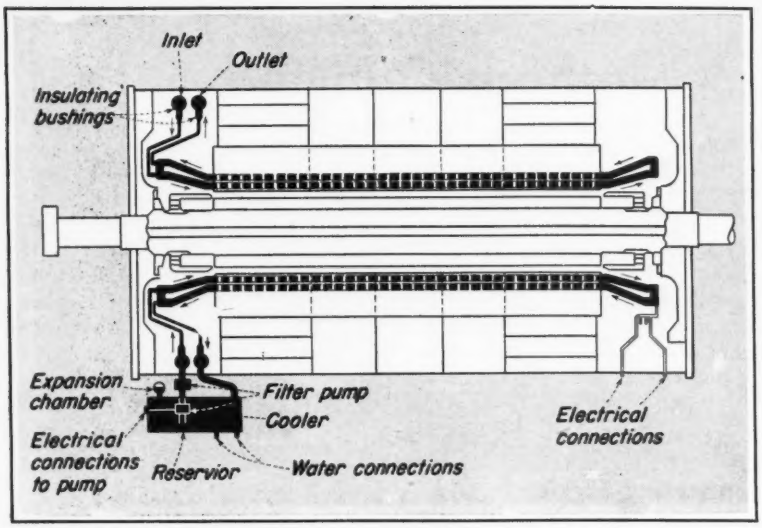
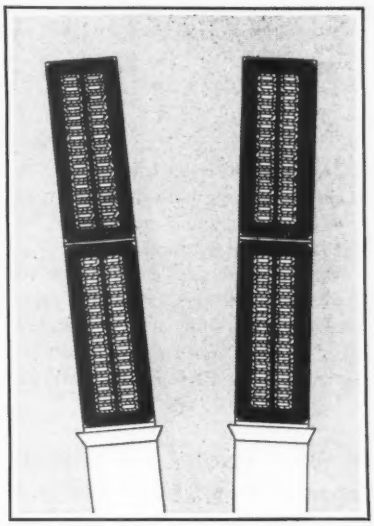


COOLING LIQUID FLOWS under pressure from intake header, through tubular conductors, to another header. Insulators with hollow centers electrically isolate conductors and headers



ARMATURE BARS are made from transposed strands like those used to make Roebel bars

Liquid Generator Cooling Under Development

C. E. KILBOURNE, Electrical Engineer, Turbine Division

J. B. McCLURE, Manager, Power Generation Section, General Electric Co, Schenectady

A liquid cooling system is being developed by General Electric Co that will extend present thermal limitations of large generator stators.

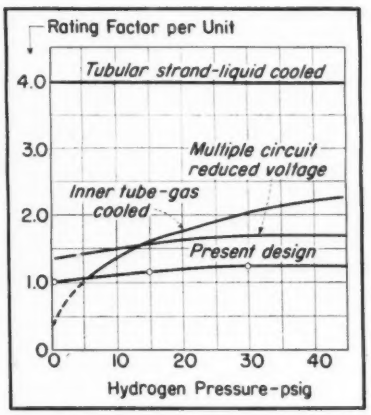
With liquid cooling about 15 times as much heat can be removed from the copper as could be removed through the normal ground insulation with the same copper temperature. Thus a liquid cooled winding can carry about four times as much current in the armature bars as could be carried by similar conventional bars.

The system provides for pumping a coolant through rectangular, tubular conductors, entering through a manifold at the turbine end. After flowing through the conductor, the coolant enters a similar header at the other end of the circuit. From here it can either be returned to the intake manifold or diverted to an external circuit.

Both ring-type headers are located on the opposite end from—and are similar in size and location to—the electrical circuit connections. They are so placed to simplify assembly.

Insulators, such as used on hermetically sealed capacitors, having tubular center passageways connect the headers and conductors. These insulators are the only nonmetalic parts of the system. Moreover, their fused joints are the only fluid circuit connections that are not soldered.

All electrical parts of the fluid system have ground insulation similar to the electrical system. This insulation overlaps the insulators and provides a completely insulated path with internal creepage distance for transition from the high voltage windings to the headers.



COOLING CAPABILITIES of different systems show liquid cooling is more effective

The external fluid circuit contains a storage tank, two coolers and two pumps. These parts and their arrangement are based on transformer design. Duplication of the coolers and pumps are required for maintenance or repair of these parts.

Only several horsepower are required to circulate the coolant contrasted to the several hundred kilowatts loss involved in circulating gas in the gas cooling method.

Liquid cooling is adaptable to almost any type of electrical connection. This allows the maximum of flexibility in designing machines and permits the most suitable balance between voltage and current.

Disadvantages of liquid cooling are chiefly confined to details of plumbing. Designs now in progress show that these problems can be adequately taken care of.

To guard against discharge of fluid from a minor leak inside the machine, a positive pressure differential between the hydrogen and cooling liquid can be established. This will not only tend to prevent discharge of fluid but will also provide ready means of leak detection. A leak can be detected by hydrogen in the fluid system.

Adapted from a paper entitled "Progress in the Design and Application of Large Steam Turbine Driven Generators" presented by the authors at the American Power Conference, Chicago, March 25-27, 1953.

Service-Disconnect Methods Outlined

J. A. MORRIS, Electrical Engineering Division, American Gas & Electric Service Corp, New York, N. Y.

Recommended methods for disconnecting customer's electric service are listed for specific situations. Advantages of the methods are obvious or indicated in the descriptions.

When a customer's service has to be disconnected temporarily or permanently, a method is to be applied which requires the least expenditure of man-hours and materials consistent with safety and effectiveness in preventing unauthorized reconnection.

Standardization of disconnecting methods and meter tags reading "Call Power Company for Service" will avoid delays in restoring service.

Rural residences (Method VII) and farms fed from group-service transformers (Method XI) are treated differently from urban or suburban residences when disconnection is for 15 days or more. Disconnection is recommended at the service pole to relieve the power company of all responsibility for fire or other possible occurrences.

Common Service Installations and Recommended Methods of Disconnecting Service

Single Domestic Occupancies (Urban or Suburban)

I—*Where socket-mounted meters* (either indoor or outdoor) are involved, and service is to be disconnected less than 15 days, the meters are to be disconnected by applying plastic sleeves (see Fig. 1) over the blades of the socket-meter to insulate them from the supply conductors, replacing the meter in the socket base, and resealing it in normal position to prevent meddling. No "hot" conductors or contacts have to be handled. Disconnecting and reconnecting operations can be performed without service crews and with minimum experience.

II—*For service disconnection of 15 days or more,* the socket-meter is to be removed from the mounting device, the opening covered with a standard blanking plate (steel, plastic or glass) to prevent accidental contacts, and the cover sealed in place to avoid unauthorized removal. These precautions are urged because makeshift covers permit meddling or accidental contacts with live circuits.

III—*Where bottom-connected meters* with terminals inside a safety cabinet or weatherproof enclosure are involved, the meters are to be disconnected on the line side, exposed wire ends are to be insulated with rubber and friction tape or special insulating sleeves (see Fig. 2), and the enclosure sealed to avoid meddling with the contents. Precautions are to be taken in disconnecting the supply conductors to avoid their contact with the grounded meter case or enclosure.

IV—*Where open-loop meters* (either indoor or outdoor) in single occupancy dwellings are involved, the service-drop conductors are to be disconnected from the source of power supply. When the service-drop terminates on a pole attachment supporting bare low-voltage conductors, the service-drop wrap around the attachment is to be removed and attached to the metal pin to avoid possible contact with live conductors.

V—*Where old-sequence service* (service to fuse to switch to meter) is involved, the service fuses are to be removed and left in the service-switch enclosure which is to be resealed to avoid meddling. This method expedites service disconnection and restoration.

VI—*Where unauthorized use of energy is not prevalent,* and only in residential sections approved by the local manager, the "Read-Out Disconnect," which is not a physical disconnection, may be permitted for no more than one reading period. This method consists of merely reading the meter on discontinuance of service, presenting final bill based on this reading to the outgoing customer, and using the same reading as initial reading for the next customer. If application for service has not been made before the next reading period, the service is to be disconnected by the appropriate method listed above for the specific situation.

VII—*If rural-residential service* is to be disconnected less than 15 days, apply Method I; for 15 days or longer, apply Method IV.

Multiple-Domestic Occupancies (on same service conductors)

VIII—*Where open-loop meters* in multiple-domestic occupancies are involved, the supply conductors are to be opened at some point between the meter line terminals and the connections to the service mains where the disconnected conductors can be sealed against meddling. The meter is to be tagged "Call Power Company for Service." Obviously a multiple-occupancy service with open-loop meters cannot be disconnected at the service pole without disconnecting all meters on the same service drop.

IX—*For other multiple-occupancy installations,* apply appropriate disconnecting method listed for specific single-occupancy class.

Farm Installations (involving power for farm operations)

X—*Where individual transformers* are involved, service is to be disconnected by removal of primary fuses of the supply transformer by a serviceman.

XI—*Where group-service transformers* are involved, and disconnection is to be less than 15 days, apply Method I; for 15 days or longer, apply Method IV.

Power Installations Involving Individual Transformers

XII—*Where 600v or less* is supplied, apply disconnection Method X. Unless "power" service disconnection is for delinquency in payment, or maintenance and repair, the metering devices are to be removed because the succeeding customer's requirements are usually different and may necessitate different equipment.

XIII—*Where more than 600v* is supplied, apply disconnection Method X or have serviceman open the high-voltage disconnect switches. See supplementary instructions under Method XII.

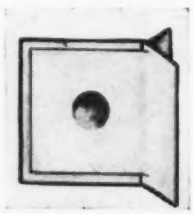


Fig 1 Plastic Sleeve used for socket-meter blades suggested in Method I

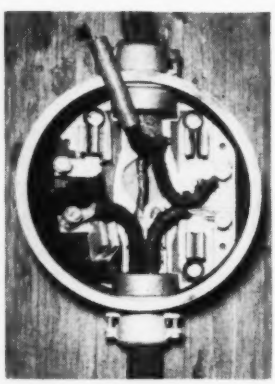
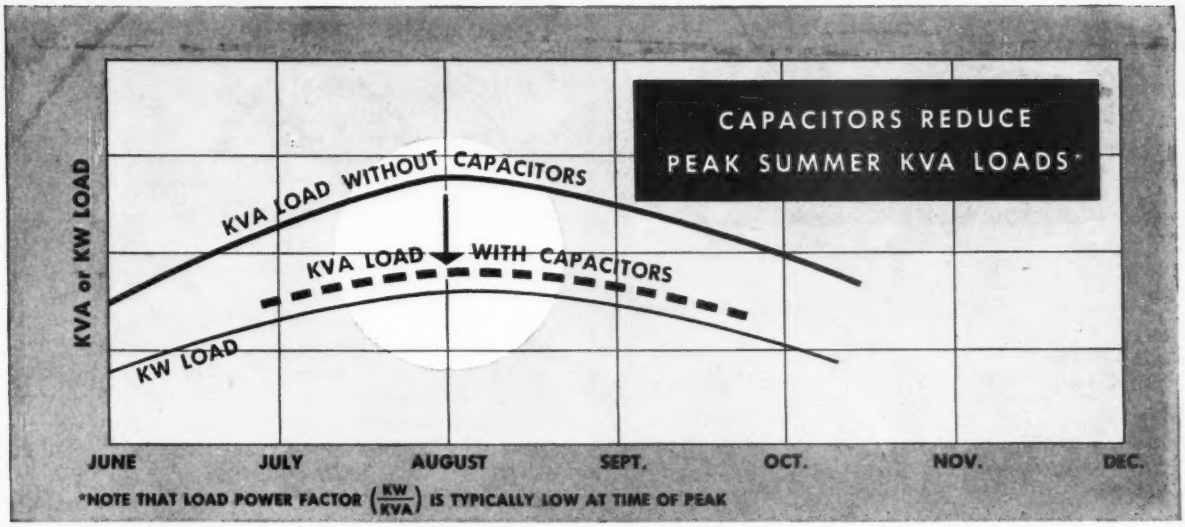
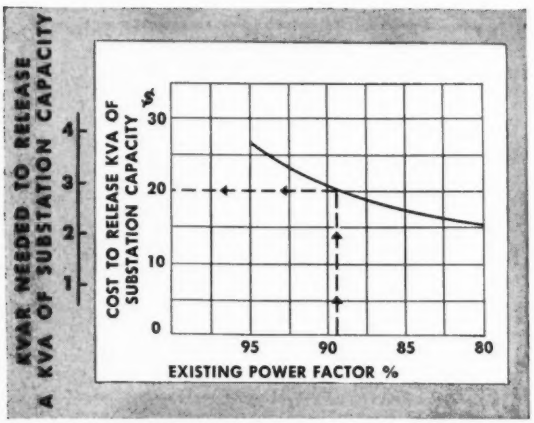


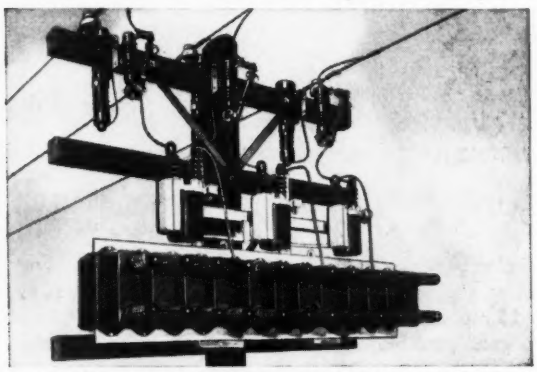
Fig 2 (right) Insulating Sleeve used for wire terminal suggested in Method III



Utilities report: G-E capacitors solve summer load problems economically



WHAT IT WILL COST YOU to lower your peak summer load with capacitors. At 89% power factor, a KVA of capacity can be released with about 3 KVAR of capacitors costing $20.



LOW-COST, LIGHT-WEIGHT automatically switched capacitors are available for use on distribution circuits. This 300-kvar G-E equipment costs less than $6 per kvar.

Relieve overloaded equipment—release a KVA of system capacity for only $15 to $25

During summer months, low-power-factor air-conditioning loads create a serious problem for utilities—particularly those in warmer climates. The high kilovar content of these loads overloads transformers, causes excessive voltage drop and high power losses.

CAPACITORS—THE PRACTICAL SOLUTION

Capacitors are widely accepted as the economical solution to this problem. Installed in fixed and switched banks on distribution substation busses or outlying distribution poles, capacitors reduce KVA loading of substations and overhead lines. And the switched capacitors can help regulate voltage—keep voltage up right out to the ends of feeders.

BENEFITS FROM CAPACITORS

1. Capacitors allow two to three times more load to be carried on voltage-limited circuits.

2. Capacitors release thermal capacity—permit substations to carry more kilowatts.

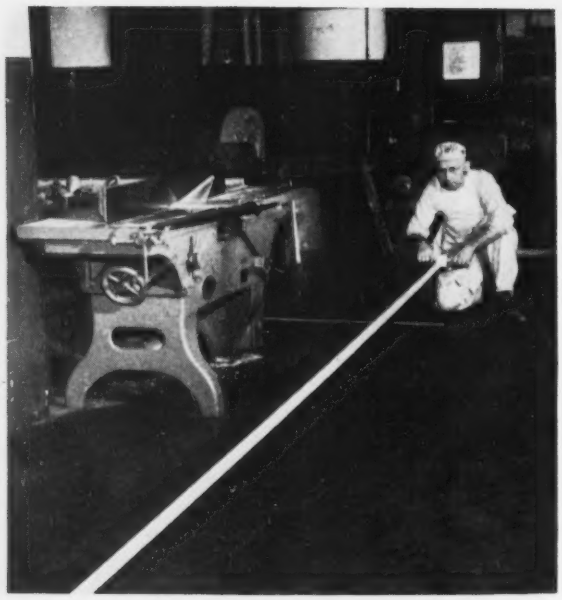
3. Capacitors often pay for themselves out of savings resulting from reduced system losses.

IF YOU HAVE A SEASONAL LOAD PROBLEM

If you have a seasonal load problem, it will pay you to investigate General Electric switched capacitors. For full information, get in touch with your nearest G-E representative or write General Electric Company, Section 441-4, Schenectady 5, New York.

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

GENERAL ELECTRIC



CLEAR SHARP LINES with straight edges mark lanes in construction shops. No chalk lines are required as tape is stretched and placed in long sections. Sharp corners are easily made by cutting tape

Tape Marks Aisles Quickly, Clearly

C. L. RING, Supervisor, Sheet Metal and Carpenter Shop, Electrical Construction Department, Shops and Tool Service, Commonwealth Edison Company, Chicago, Ill.

Adhesive back tape marks aisles in Commonwealth Edison's Electrical Construction Department shops with a clear sharp outline. The straight edges of the tape make a much more attractive appearance than a painted line. Cost of the tape, approximately $5.00 per roll, is more than offset by the saving in time of application.

No chalk lines are required, as tape can be stretched out and laid down in long sections. Sharp corners of any degree can easily be made by cutting tape to desired angle. This eliminates the costly process of finishing corners by hand brushing where striping cannot be maneuvered.

Overtime costs have also been eliminated, as traffic can move over tape directly after application, whereas, paint must be applied after working hours to allow for drying. The tape also keeps its appearance and lasts three to four times as long as painted lines. It is available in various colors.

10X SPOTTER'S TELESCOPE on steel unipod with swivel joint

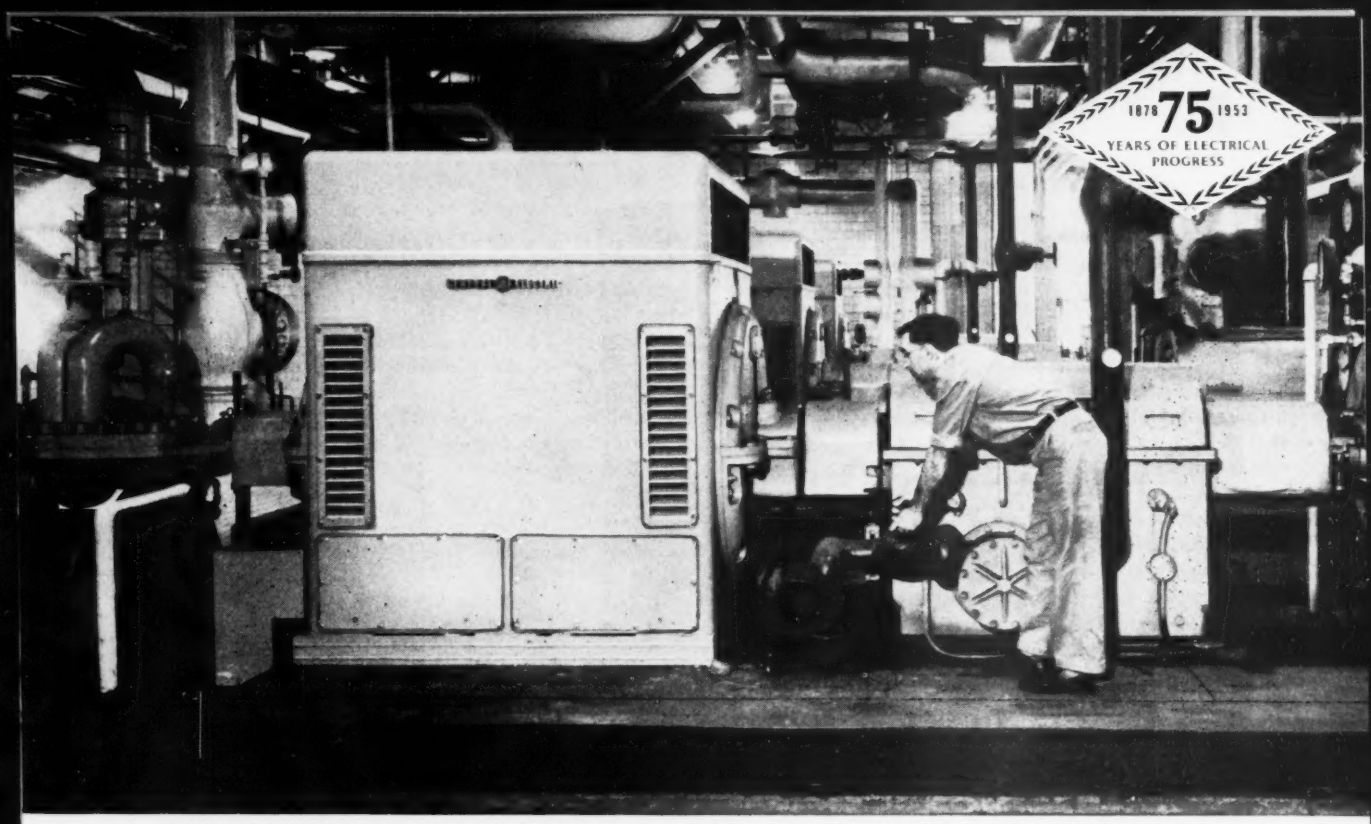
EXAMINING JOINT on upper phase conductor 200 ft from observer

Hot Joints Detected By Telescope

P. J. SANDIFORD, Research Physicist, The Hydro Electric Power Commission of Ontario

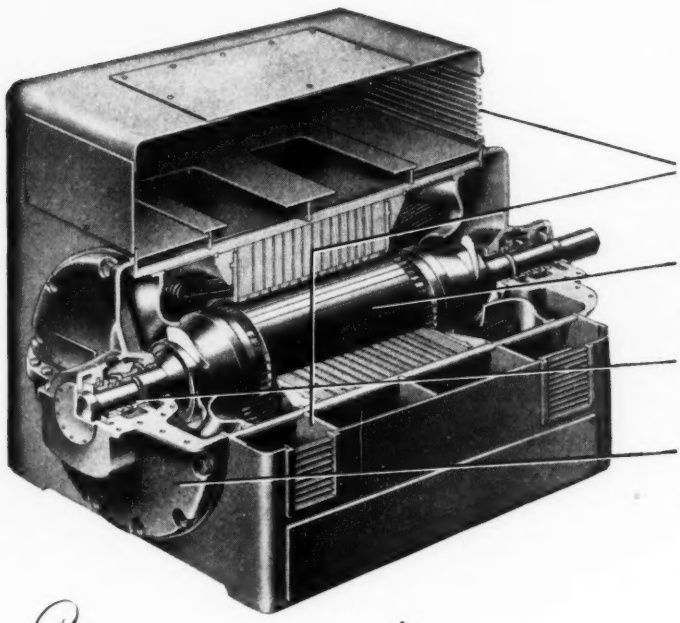
Overheated joints on transmission lines can be detected by a simple method using only a small telescope. Field tests of some 700 joints showed that the method was capable of detecting all the joints which, as measured with the bolometer for comparison, were more than 10°C above ambient, the measurements being carried out in winds below 15 mph.

A small percentage of the joints on the older lines may develop excessive resistance due to corrosion, mechanical stress or faulty construction and may show temperature rises as high as 100°C over ambient. Joint tests have previ-



DETROIT EDISON RELIES ON 3 G-E BOILER FEED PUMP MOTORS IN THEIR MODERN CONNERS CREEK STATION BECAUSE . . .

New G-E Boiler Feed Pump Motors Are Custom-built for Power Stations



Here's a motor designed especially for boiler feed pump service. It's a revolutionary design . . . with modern styling . . . operates quietly . . . directs discharge air away from personnel . . . conserves valuable floor space in power stations.

UNIQUE VENTILATION SYSTEM permits closer parallel spacing of motors . . . prevents recirculation of heated discharge air . . . improves personnel comfort. Air entering sides is discharged high above endshield away from adjacent motors and personnel.

STREAMLINED ROTOR construction prevents "siren" effect—built-in air deflectors and large discharge chamber cut over-all noise level.

DUAL LUBRICATION SYSTEM combines the advantages of force-flood lubrication and self-lubricated oil rings . . . gives extra protection . . . assures long, reliable bearing life.

COMPLETE 360 DEGREE ENDSHIELD supports bearing from top as well as bottom . . . assures continuous, accurate bearing lineup. Both endshield halves are sturdy ribbed castings.

For more information contact your G-E representative or write for Bulletin GEA-5813 to General Electric Co., Section 753 2, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

ously been made with the infrared bolometer developed by J. R. Leslie of this Laboratory. This is an accurate and sensitive instrument but is expensive, relatively heavy to carry over rugged terrain and requires technical skill to operate.

The new method, although not quantitative nor quite as sensitive as the bolometer, is simple, quick and cheap. It is based on the shimmering of objects seen through air that is hotter than its surroundings. In this instance the heated air originates at the defective joint and drifts downwind from it in turbulent eddies. In order to see any shimmering it is necessary to use a telescope (10 power is best), directing the line of sight almost parallel to the joint so that the "target" beyond the joint is viewed through the longest possible path of heated air.

The target may be trees, or a tower; by far the best results, however, are obtained when it is a parallel conductor or overhead ground wire so viewed that there is apparently a narrow strip of sky between the joint and the "target" wire. The target appears to wave and shimmer violently when heated air flows in front of it. The effect is remarkable, a hot joint seeming to be "smoking," with the smoke originating from the hottest part of the joint.

In the Laboratory . . . An artificial hot joint was made of an aluminum tube containing a 500-w strip heater. Tests showed 30°C rise could easily be detected in 3 to 8 mph wind and could still be observed at 30 mph. The minimum detectable is about 10°C in winds up to 10 mph. Temperature rise is the same for all ambients so the relative refractive index of the sheath of hot air around the joint is independent of ambient temperature.

Advantages . . . A survey of a large system can be made easily because of the availability of suitable telescopes which can be operated by non-technical personnel. The telescope used in the field surveys weighs less than 2 lbs complete with unipod support, is only six inches long and costs less than $20.

Disadvantages . . . The intensity of the effect depends on wind velocity and viewing position. An operator can only class the joints as "cold," "suspicious," "warm" and "hot." Under optimum observing conditions on sunny calm days the shimmering due to solar heating of the joint can just be detected and may cause a normal joint to appear faulty. An experienced observer can usually avoid this mistake.

Torque Checker Cuts Register Testing Time by 75%

ROBERT MARSHALL, Supt of Meters, Relay Tests & Installation, California Electric Power Co, Riverside, Calif.

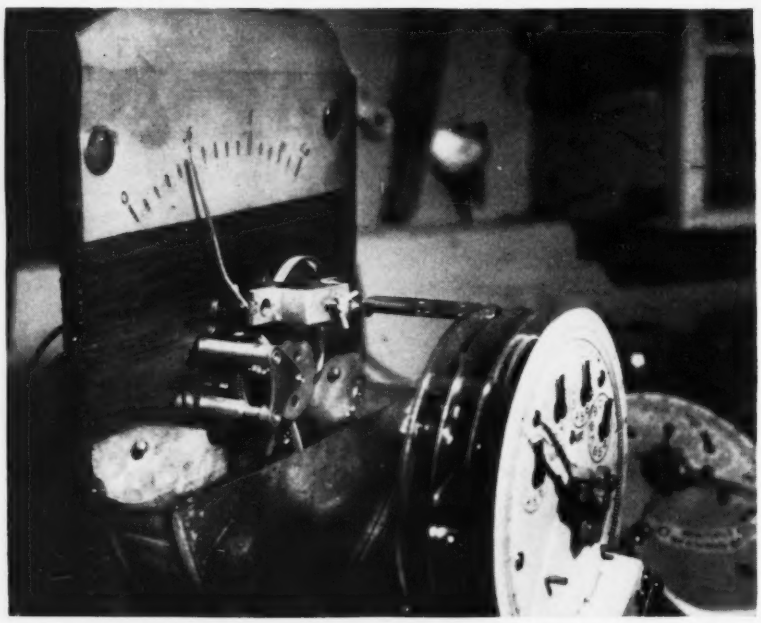
Time for friction settings on T-3 demand registers has been cut from 2 to 3 hr to about 30 min by a torque checker designed and built by California Electric Power Co. This device permits a quick test of the 5 to 8 sec out-period and eliminates use of standard weights to determine that the proper amount of friction exists in the demand arm.

The torque checker consists of a synchronous motor, geared to 1 rpm, driving a modified differential gear assembly from a T-3 register. Soldered to the center assembly of the gear assembly is a pointer, indicating centimeter-grams torque due to friction, and a vane that moves in an oil dashpot to dampen pointer movement. This indicating assembly is mounted on a wood frame with a scale behind the pointer.

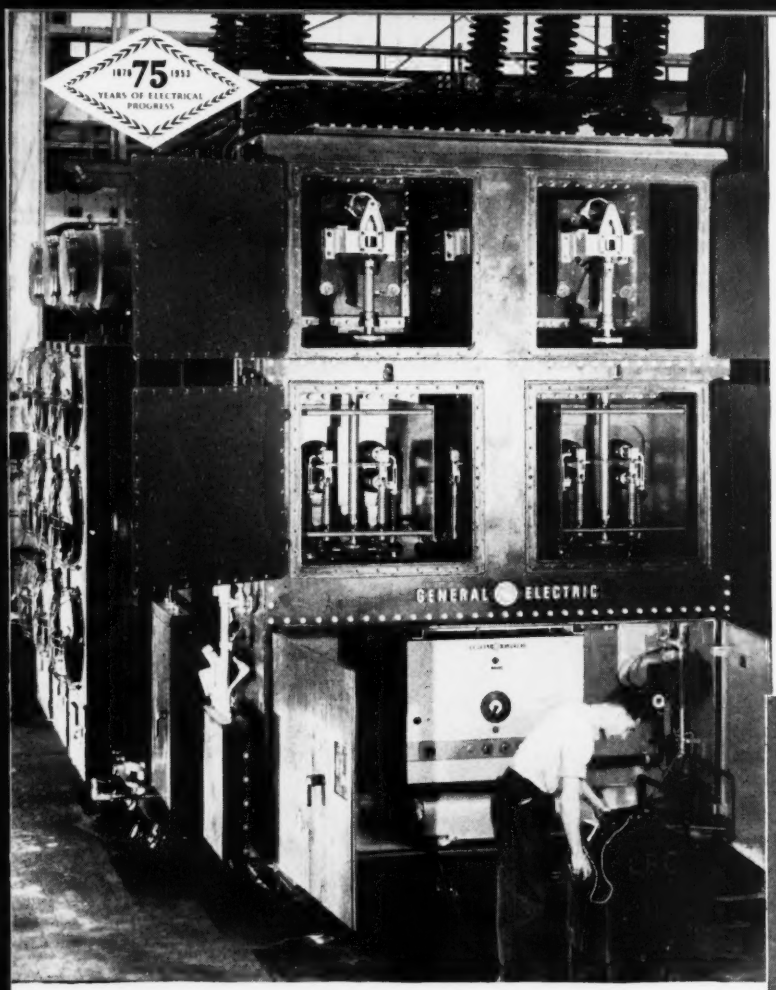
Registers to be tested are mounted in a steel bracket also designed and built by the company. One of three legs of the bracket is a set screw to allow for minor levelling adjustment. The bracket also holds the demand register in a convenient position for an operator to make adjustments.

In operation, the register is positioned so that its drive dog is engaged by the dog on indicating assembly. The differential gear in this assembly will ride up the main gears and cause the pointer to indicate total friction in demand register. If this friction is not within 0.4 to 0.5 centimeter-grams of torque, the operator makes proper adjustments on the friction brake.

By tripping the brake arm, the operator can get an indication of friction in the register up to its differential assembly. This test will indicate excessive backlash in the gears, or whether gear teeth are worn or defective. Formerly an indication of these troubles was had only after continuous adjustment of the friction brake at various values of demand, a procedure which took up to three hours for each register.

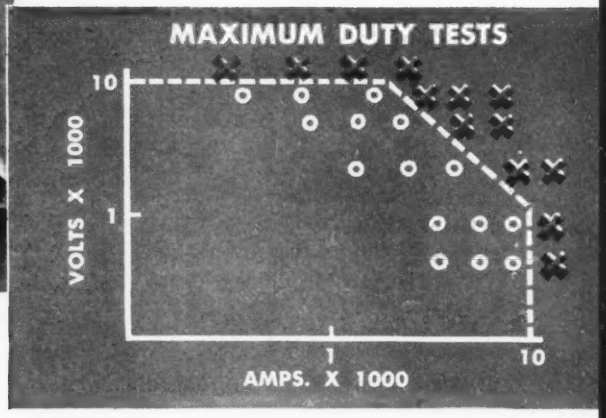


DIFFERENTIAL ASSEMBLY is heart of torque checker, which speeds proper setting of friction on T-3 demand registers. Testing for the out-period is also accomplished with the checker



FINAL TESTS on control wiring are made prior to shipment. Large, hinged doors, re-usable Nitrile rubber gaskets, and roomy compartments simplify field inspection and maintenance.

No need to worry if a short circuit occurs during a tap change



G-E Load-Ratio-Control operates successfully even under maximum short-circuit duty

If a system short circuit occurs while a tap change is under way, General Electric Load-Ratio-Control is designed to complete the operation successfully . . . *even under the maximum short-circuit duty to which the transformer may be subjected.*

Contactor interrupting tests, made during the design of each standard LRC mechanism, assure you of dependable operation. Oscillograms of each test shot record the current and voltage values and the arcing time. These points are plotted on a logarithmic chart like that shown above. Points showing excessive arcing time are recorded as crosses. Satisfactory tests are recorded as circles. A line enclosing area of satisfactory performance under short circuit defines the range of normal application of contactor.

From such test data, G-E transformer designers are furnished an application chart for each standard equipment that shows the range of transformer ratings to which the equipment can be applied.

Remember too, that in G-E load-ratio-control, the four design factors: insulation life, arcing-tip life, mechanical life and short-circuit duty are all *co-ordinated* to give you good service, longer periods between inspection and less maintenance.

For full information on G-E Load-Ratio-Control, contact your nearest G-E Apparatus Sales Office, or write General Electric Company, Section 421-7, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC

The torque checker permits an operator to determine whether register is within the 5- to 8-sec out-period as recommended by the manufacturer. To do this the operator sets the register so that it will reset automatically. Using a stop watch, the operator counts the time between two successive clicks, which indicates the start and finish of the automatic reset operation.

Another function of the torque checker is adjustment of friction in the demand arm so that it will not lose or gain indication due to vibration at the meter location. This test is possible without the use of standard check weights. The operator sets demand arm and lever to zero and then moves the arm to a desired point on scale. As lever engages demand arm, the operator gets an indication of friction in the arm by watching the torque checker. Every point on the demand scale can be checked and adjustments can be made when they are required.

Rubber Gloves Checked with Hi-Voltage Tester

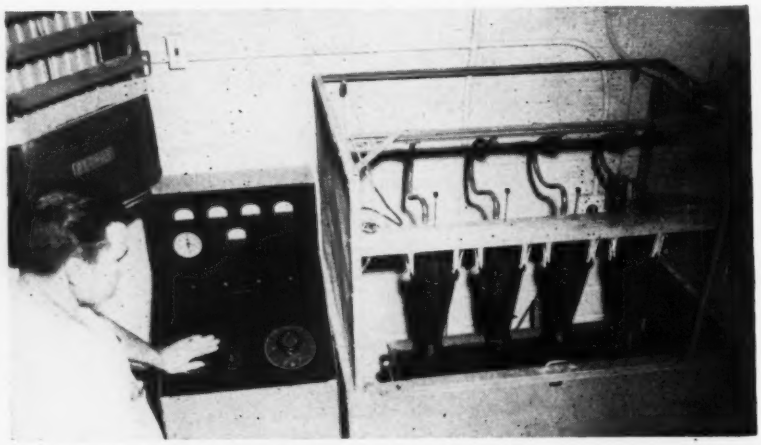
W. C. PRICE, Electrical Engineer, Central Meter Department, Central Power and Light Co, Corpus Christi, Texas

To expedite the handling and testing of an ever increasing number of rubber gloves, Central Power and Light Company has devised a tester that will cut in half the handling time required on each pair. As the company has expanded its electrical facilities, the number of gloves required has constantly increased to a present peak of 850 pairs, with more added yearly. Each pair of gloves is cleaned and tested at least once each 60 days. Previously, the gloves were tested in a unit suitable for only one pair of gloves and without any internal water system. The filling of the gloves with water by hand required much time and wasted water.

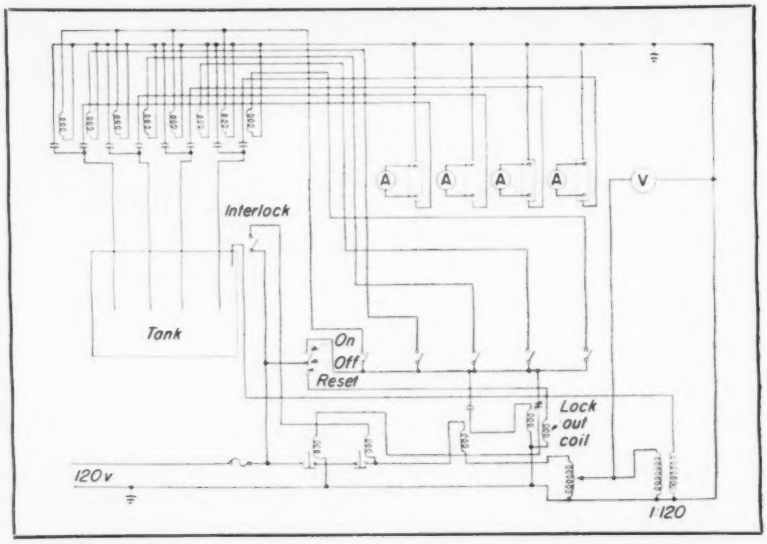
The new tester consists of two units: First, the glove holder that holds the two pairs of gloves under test and the complete water system. The other, a control console, consists of the high voltage transformer, variac, meters, relays, and switches. The use of two units allows the working parts of the electrical system to be completely isolated from the water system. The control panel of the console is inclined and all meters are mounted vertically for ease in use and meter reading.

Gloves may be tested for leakage current and for break down voltage. Any voltage up to 15,000 volts may be applied between the outside and inside of the gloves while submerged in a warm water bath. The leakage current of each glove may be read directly in milliamperes.

A lock out relay completely de-energizes the console if a glove ruptures. The reset switch for the lock out is on the power switch, making it necessary for the operator to turn the tester off before continuing the test.



GLOVE TESTING is expedited with new test facilities that will test two pairs at a time. Front door is lowered for access. Electrical controls in console are isolated from the water system



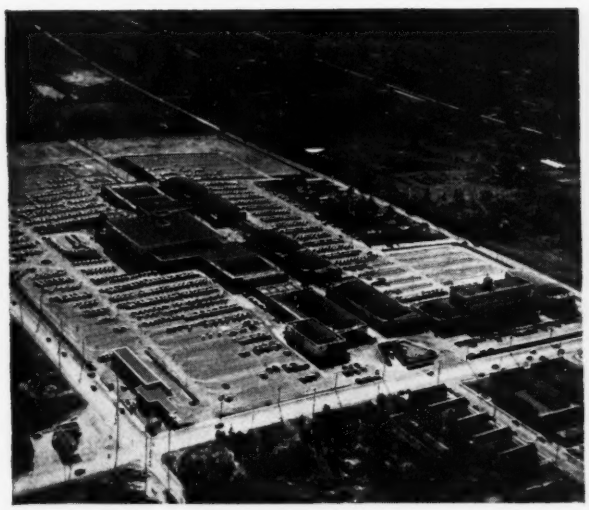
TESTER CIRCUIT has high voltage transformer, variac, meters, relays, and switches. Supply to the panel is at 120 v. Protection is provided in circuit to prevent hazard to operator

The water system is so devised that the operator is not required to move from the front of the apparatus to fill or empty gloves. A pump picks up any overflowing water from the water bath and stores it in an elevated tank. This water is re-used to fill the next gloves tested.

An interlock is mounted on the door of the glove holder so that the door must be completely closed before any

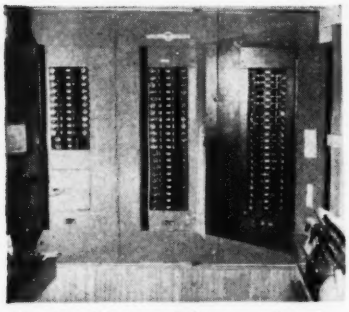
(*Continued on page* 148)

REVERE COPPER
IN TWO GREAT SEATTLE PROJECTS

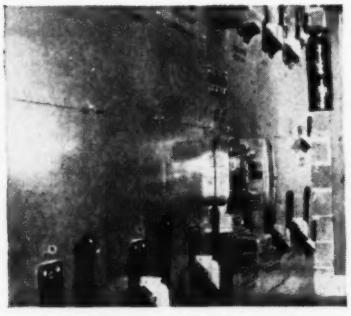


Northgate Project, suburban shopping center, seen from the air

Air view of University of Washington's Health Sciences Building



Switch and fuse type lighting panelboard for control and protection of lighting circuits in another Northgate store



Main switchboard in a Northgate store

Large electrical loads are required to serve these two Seattle projects. To carry heavy currents safely and with minimum voltage loss, prefabricated Flex-A-Power distribution systems, with copper bus bars made by Revere, were installed, plus protective circuit breaker switchboards, control centers and lighting panelboards. Revere Copper, Brass and Bronze are used in these products. Flexible distribution systems and protective control equipment were furnished by Trumbull Electric, Department of General Electric Company, Plainville, Connecticut, and Seattle, Washington.

The two projects consist of the University of Washington's Health Sciences Building, dedicated in 1949, housing the schools of medicine, dentistry, and nursing; and the Northgate Project, world's largest shopping center, containing 78 stores plus 50 medical offices, a hospital, a theater, covering 26 city blocks. In the generation and use of electricity copper is preferred, because it has the highest electrical conductivity of all the commercial metals. Revere is proud to have supplied copper for these two large projects, and to many others the country over.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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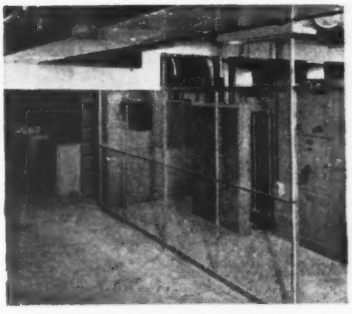
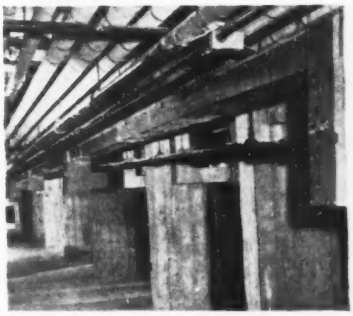
• •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities. Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

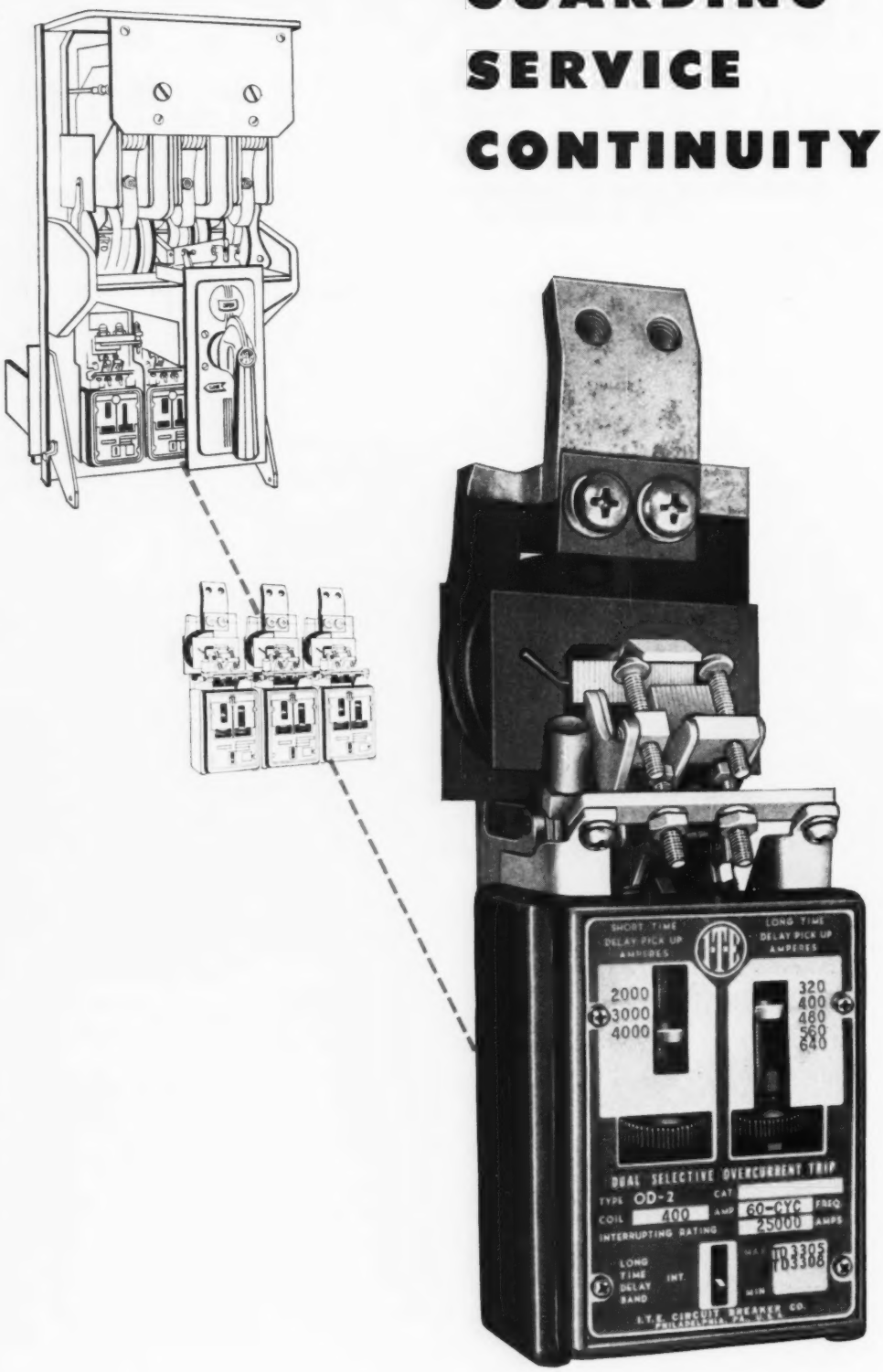


Electrical distribution runs fan out from four dead-front, self-contained load centers located in Health Sciences Building basement



Four-wire, 2000 amp Trumbull Flex-A-Power system distributes power throughout new Health Sciences Building

GUARDING SERVICE CONTINUITY:



integral selective trip protection in I-T-E Circuit Breakers

Include this direct-acting device in your switchboard planning

Selective tripping allows the most effective use of large air circuit breakers when high reliability of service is essential. With it, several circuit breakers may be used in series; yet on overcurrent or fault only the affected circuit is interrupted. The breaker nearest to the trouble trips. The breakers nearer to the power source remain closed.

The I-T-E Type OD-2 Selective Overcurrent Trip Device is a means of accomplishing this—without current transformers, relays, or additional switchboard panels.

The OD-2 device offers accurate long-time delay (in seconds and minutes) to provide inverse time current protection on overloads. It also offers accurate short-time delay (in cycles) to provide selectivity between breakers when a short circuit occurs. The trip device is sturdy, compact, shock resistant. Time delay elements are sealed and require no maintenance.

I-T-E Circuit Breakers with these devices should be considered for every new low-voltage switchgear application. In recent years, installations using I-T-E breakers with selective trip devices have been made in central stations, in manufacturing plants, and in processing industries. They have saved in initial investment, in reduced breaker maintenance, and have provided greater reliability to the systems.

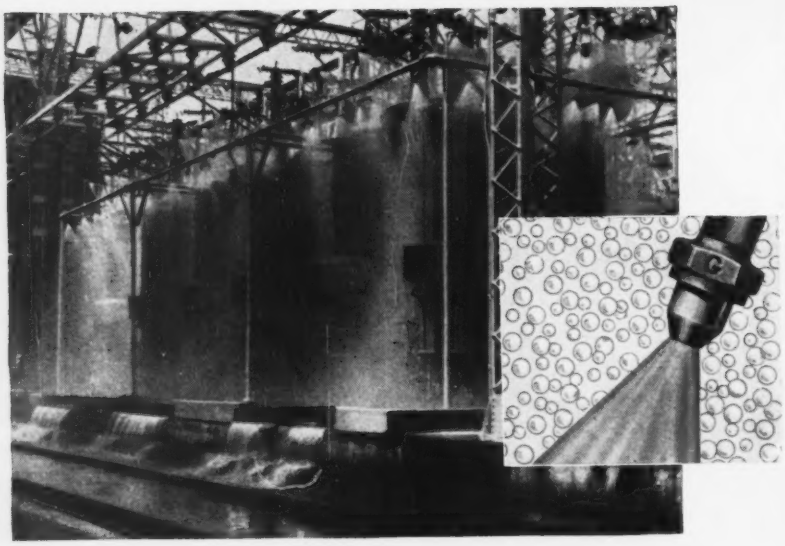
***Bulletin 5301* gives full details. Send for a copy.**

I-T-E Type OD-2 Direct-Acting Dual Selective Overcurrent Trip Devices are compact *integral* parts of the circuit breaker. Adjustments can be made for long-time current pickup, long-time delay, short-time current pickup, and short-time delay.

LOW-VOLTAGE SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY • 19th AND HAMILTON STS., PHILADELPHIA 30, PA.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto



OIL FIRES

From our files . . . facts about 3 typical oil fires which Grinnell Mulsifyre System quickly, safely

EXTINGUISHED

Complete extinguishment of fires within areas protected with Grinnell Mulsifyre sprays is usually obtained in a matter of a few seconds after the water discharge starts. Case histories prove that Mulsifyre projectors are effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. In these oils the surface emulsion remains to give after-protection against flashback.

Avoid future trouble from fire. Check the facts below on the reliable way Grinnell emulsion-forming spray systems operate. Then communicate with Grinnell Company Inc., Providence, R. I. or with one of the branch offices located in principal cities.

The record speaks for itself . . .

1. This is a case of a bank of three 12,500 KVA single phase transformers, oil insulated and water cooled. An arc flashed below the oil surface from low voltage leads to the iron core. Relief diaphragm ruptured, forcing out oil whose vapors ignited. Automatically operated Mulsifyre System extinguished the fire before it could damage adjacent transformers.

2. Here's another instance...drizzle-wetted coal dust, streaking on an insulator, caused a flash-over which ignited an oil spill. Manual operation of a gate valve turned on the fixed Mulsifyre System, extinguishing the fire.

3. And another! Repeated operations of automatic circuit breakers due to severe electric storm caused oil spray and spillage which was ignited by flames coming from tanks through explosion vents. The explosion blew out three outside brick walls of switch room. The Mulsifyre fire protection system went into action and it extinguished the resultant fire.

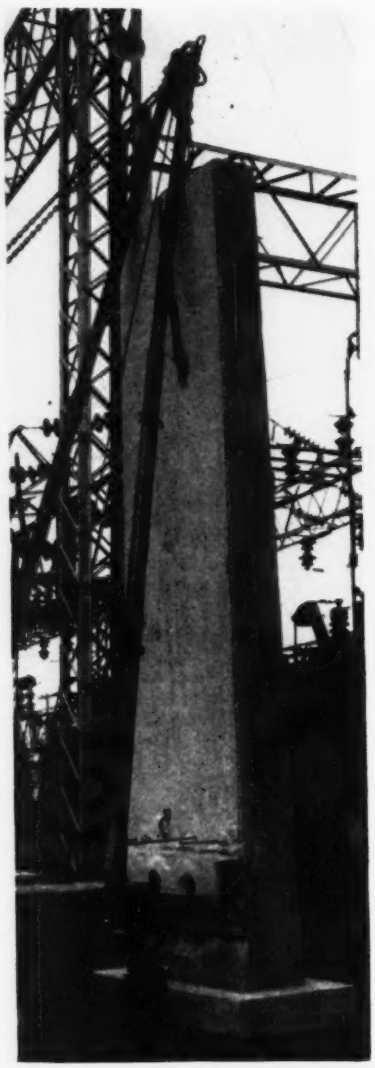
GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

Glove Testing

(*Continued from page* 144)

voltage may be applied to the gloves. Opening the door completely grounds out the high voltage system. This protects the operator in case any part of the tester fails to function.



CABLE TERMINAL PEDESTALS are cast of special expanded shale concrete, hauled by truck to the job and set in place with winch. Eyes for lifting are cast in the concrete

Precast Cable Terminal Pedestals Cut Costs

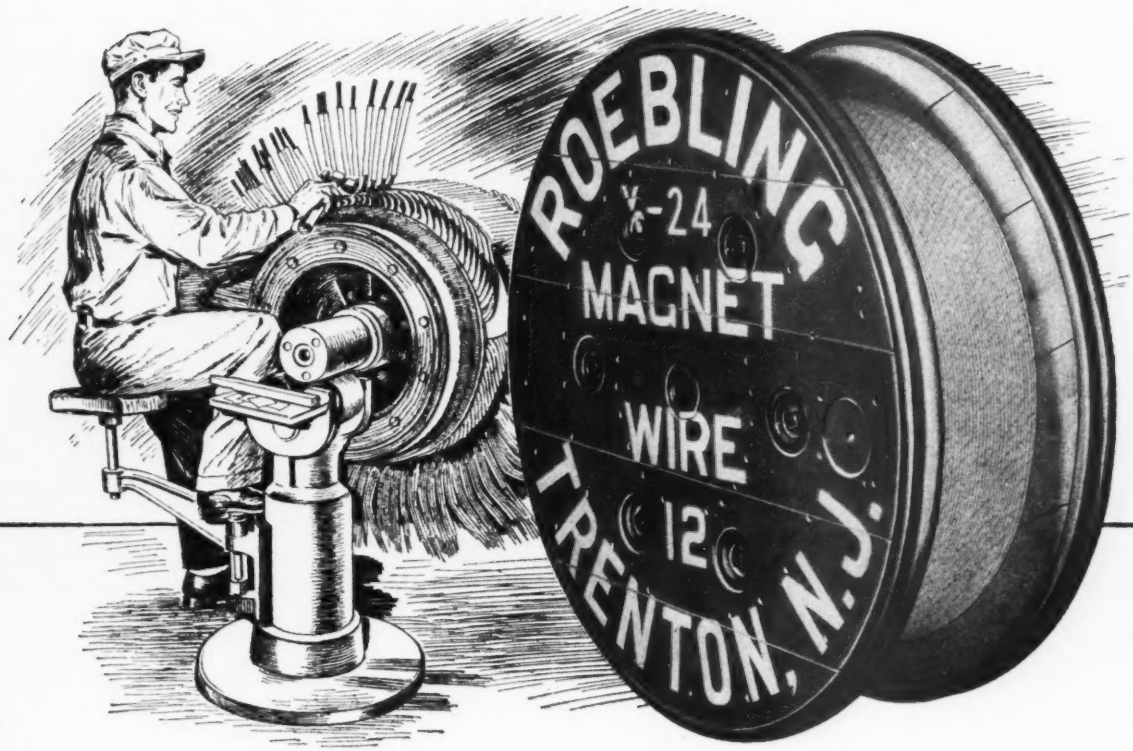
S. J. WARD, Superintendent of Substation Construction, Houston Lighting and Power Co, Houston, Texas

Concrete power cable terminals are precast in the construction headquarters yard of Houston Lighting

(*Continued on page* 152)

Now...a new high temperature magnet wire...

ROEBLING ROETEMP



ROETEMP MAGNET WIRE brings you a brand new and superior type of insulation for applications that involve high operating temperatures. Its heat-resistant properties and dielectric strength, its extra toughness and working ease make this new Roebling ROETEMP your top choice for Class B transformer windings and for other electro-magnet devices that operate up to 105°C., with a hot spot temperature of 125°C.

Roebling ROETEMP Magnet Wire is insulated with a specially processed tape applied in a single wrap with a liberal overlap. It is exceptionally pliable and bends without cracking or separating from the conductor. It won't unravel; is ideal for higher speed winding; comes in a range of sizes from #1 to #12 AWG, round, square and rectangular.

Write for data on Roebling ROETEMP Magnet Wire. . and Roebling silicone bonded ROEGLAS wires for special temperature problems. John A. Roebling's Sons Corp., Trenton 2, N. J.

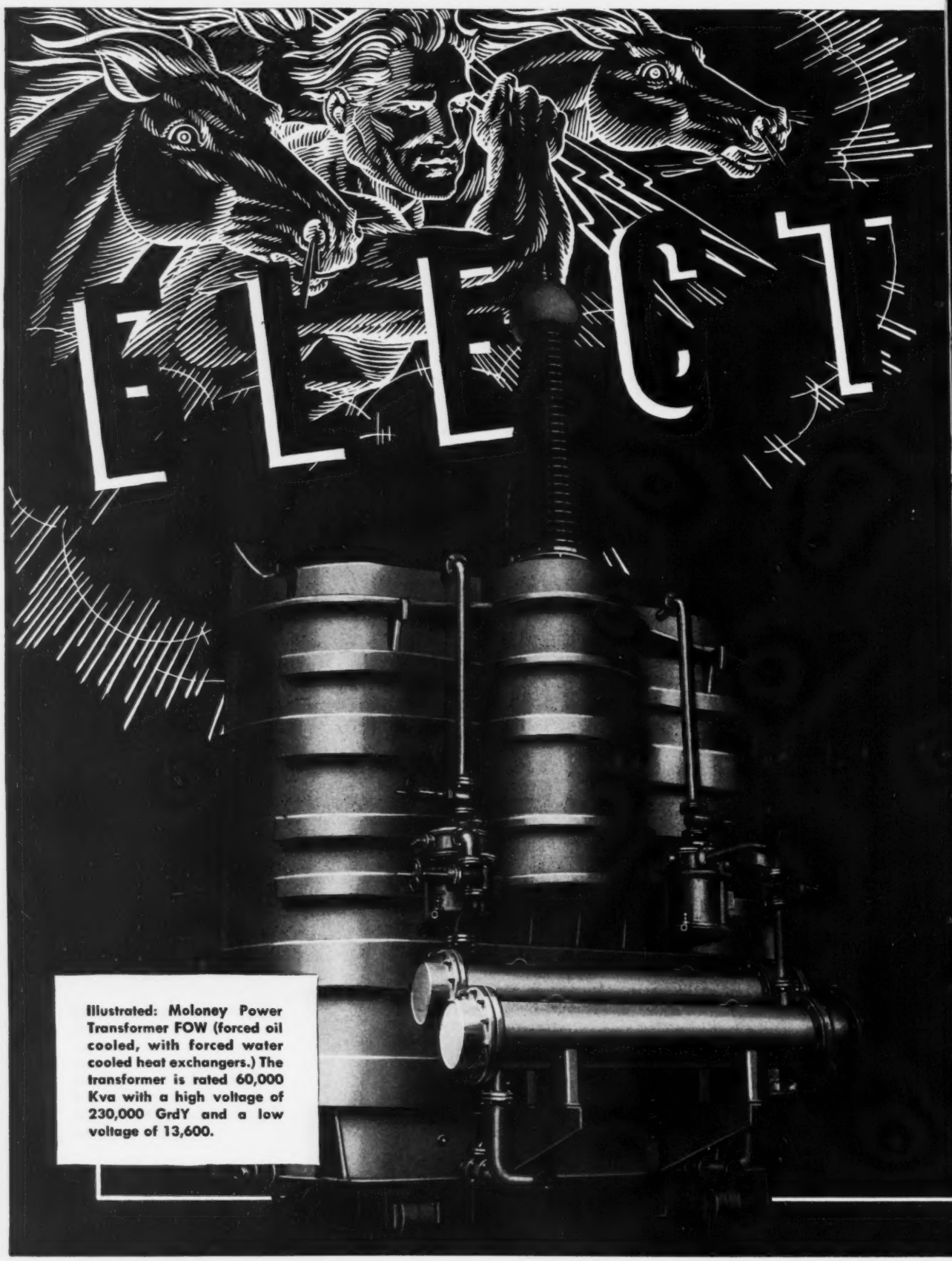
A subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST & 120 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH, 1301 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

CF&I

JAR ROEBLING



Illustrated: Moloney Power Transformer FOW (forced oil cooled, with forced water cooled heat exchangers.) The transformer is rated 60,000 Kva with a high voltage of 230,000 GrdY and a low voltage of 13,600.

RICITY

WITH all our progress in this, the 20th Century, we still have no completely satisfactory explanation of what electricity is. Yet . . . we know that electricity has changed the pattern of the world.

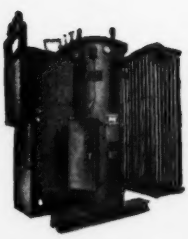
Here is this tremendous force, which we can't explain but can control by flicking a switch, in use everywhere, constantly sustaining the industry and life of this nation and the world. Experience, engineering and research have done much to permit the efficient use of this power. Utilities everywhere have come to recognize the importance of Moloney Equipment in transmitting and distributing electrical energy *so economically* and *so dependably.*

ME52-16

MOLONEY ELECTRIC COMPANY

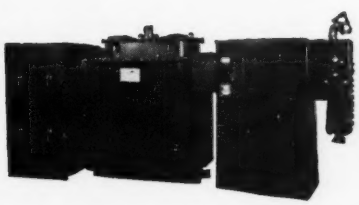
Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

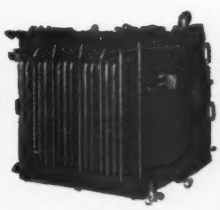


Load Ratio Control Transformers

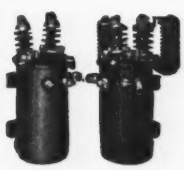
Feeder Voltage Regulators and Regulating Transformers



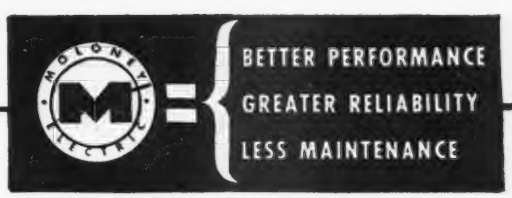
Load Center Unit Substations



Network Transformers



HiperCore Distribution Transformers



at your command . . .
an army of
seamless steel

HIGH
PRESSURE
GAS CYLINDERS

Wherever and whenever the electrical industry uses gas stored under high pressures, chances are it's in Taylor-Wharton cylinders. T-W's years of experience result in years of SAFE service for *you.*

Necessary for the storage of nitrogen, hydrogen, carbon dioxide and other high pressure gases, T-W cylinders conform to I.C.C. specifications for working pressures of 2015 PSI, 2265 PSI, and as high as 6000 PSI. *Immediate delivery* can be made in either standard or in lightweight sizes.

ESTABLISHED IN 1742
TAYLOR-WHARTON
IRON AND STEEL CO.
Cincinnati 12, Ohio
Also Manufacturers of | Manganese Steel Castings, Alloy & Carbon Steel Castings, Special Trackwork.

Precast Pedestals

(*Continued from page* 148)

& Power Co and hauled to the job when needed. This method makes it possible to build these pedestals in a horizontal position eliminating all vertical forms and bracings. Forms can be reused and pouring can be done at convenient times without tieing up whole crews and particularly highly skilled men.

Pedestals are approximately 18 ft high and weigh 8,500 lb. They are hauled to the job by truck and set in place with winch line and A frame. Special expanded shale concrete reduces weight approximately 40% which simplifies hauling and handling.

A six inch thick concrete pad is poured in the bottom of the hole and the pedestal sets on the pad. This prevents settling and shifting of position.

20-FT REACH of pole is sufficient to check height of most secondaries and services

Check Clearances with Three-Joint Pole

H. M. WILLIAMS, Inspector of Overhead Systems, California Electric Power Co, Riverside, Calif.

Difficulty of measuring clearances of distribution lines, along property lines inaccessible to vehicles, is overcome through the use of a three-joint measuring pole devised by California Electric Power Co. With the aid of a pole, an inspector has a reach of about 20 ft, which is sufficient for most secondary line and service measurements.

(*Continued on page* 157)

HI-TENSION NEWS *Junior*

How Important is *Tolerance* in a Lightning Arrester

To listed average lightning arrester ratings must be added manufacturing tolerance in order to evaluate arrester performance. How important is this tolerance?

Bear in mind that tolerance in a lightning arrester can come from only one place--the Protective Margin. Every per cent of tolerance *added to* catalog averages is *deducted from* the protection afforded apparatus. There are times when you have little protection to waste.

O-B Thorex lightning arresters have the exceptionally low tolerances of +10 per cent sparkover and +5 per cent IR discharge voltages. These close tolerances in combination with low average values leave a substantial Protective Margin available for working use. Protection is what you buy in a lightning arrester, and Thorex tolerances combined with low average values make more of this available.

Leaving out all other Thorex advantages, for the above reasons alone, you should investigate this radically improved arrester.

Ohio Brass

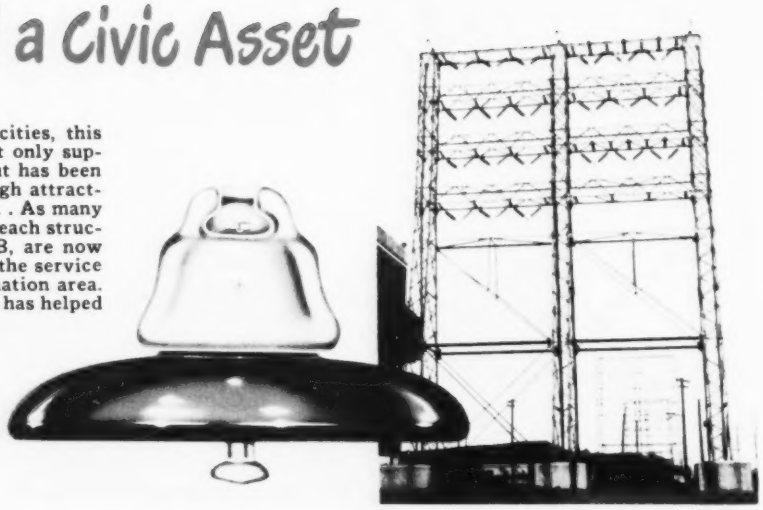
MANSFIELD, OHIO, U.S.A.

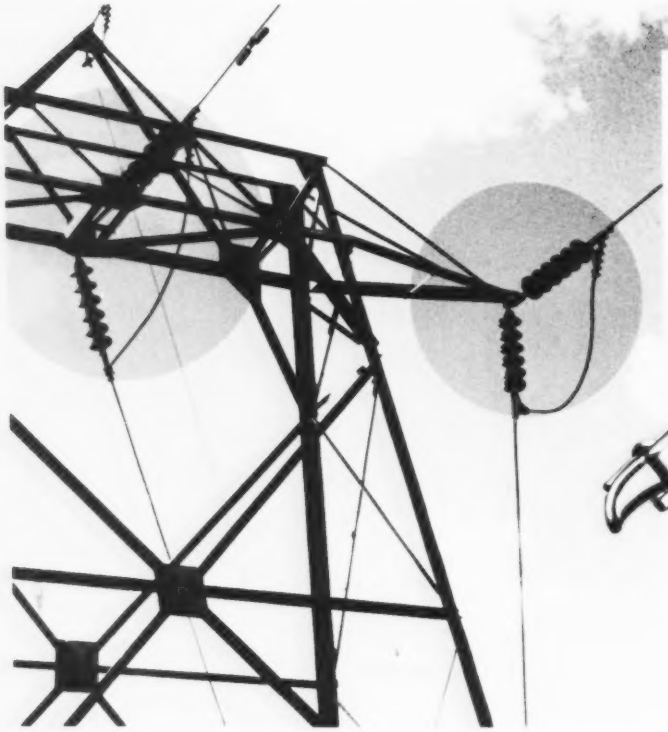
OB

HI-TENSION NEWS *Junior*

Helping Build a Civic Asset

Encircling one of our large Midwest cities, this high voltage distribution "ring" has not only supplied ample power to local industry, but has been credited with developing the city through attracting additional commercial enterprise. . . . As many as 256 suspension insulator units are on each structure. These insulators, supplied by O-B, are now nearly 30 years old. The very nature of the service places the insulation in a high contamination area. Yet the performance of these insulators has helped to make a record of reliability that has made this "ring" justly famous, and has turned it into a valuable civic asset. . . . Owners of this system have expressed their estimation of O-B insulation in the most concrete way -- by year-in, year-out continued use. This may be one of many sound reasons for making O-B *your* CHOICE OF INSULATORS.



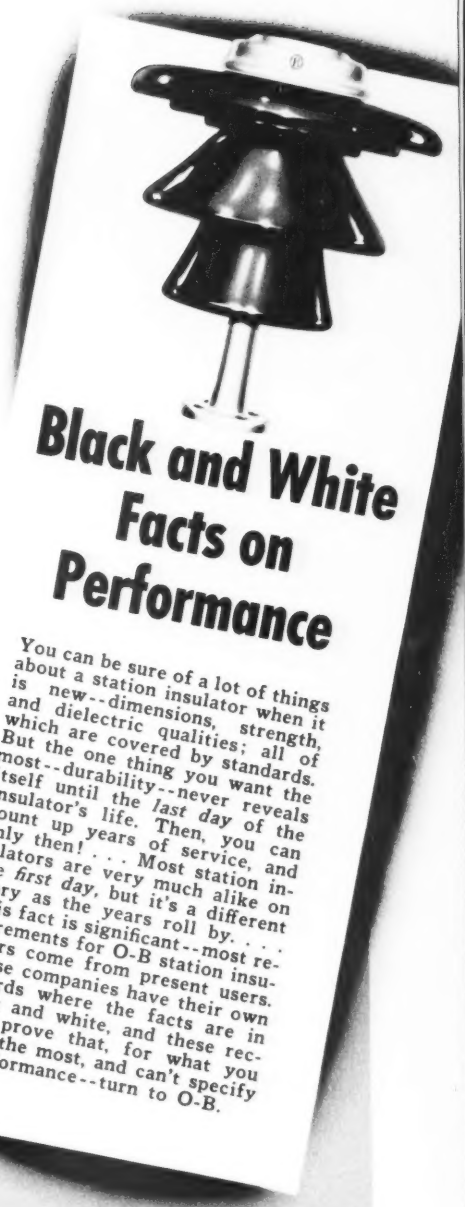


No More Spliced Jumpers

New 22-kv Post Equipped with Clamptop

● With the introduction of the new 8¾-inch O-B Clamptop line post, you can now use the popular post type insulator, plus the modern improvement of the Clamptop head, on all classes of construction from 22 to 69 kv. . . . This new size O-B post is the first combination of the pillar-shaped insulator and Clamptop head made available for 22-kv construction. . . . The modern Clamptop eliminates all tie wires and, with them, the insecure grip and troublesome serve typical of hand ties. Hot line work with the Clamptop is easy and fast, and is done at no sacrifice of conductor-holding power. Loose ends of energized tie wires, once a hazard to hot crews, are eliminated. . . . Add the handiest and best tie attachment to one of the most popular post sizes and you have the new O-B Clamptop line post. Include these in your construction standards.

● How can a strain clamp improve the conductivity of a transmission line?--by eliminating high resistance jumper splices at deadend points. . . . O-B Hi-Lite clamps permit stringing conductors straight through strain points without cutting, thus forming jumper loops with continuous cable. They install in only a minute or two and require no more field equipment than a common hand wrench. No special training of linemen is needed, and no more than common-sense care is necessary to get an attachment that will develop the full working strength of the conductor without slip. At any time, clamping power is easily and positively inspected. . . . In addition to a real saving in construction cost, O-B Hi-Lite strain clamps make possible continuous jumper loop construction with all of its operating advantages. Specify these clamps in your new plans.



Black and White Facts on Performance

You can be sure of a lot of things about a station insulator when it is new--dimensions, strength, and dielectric qualities; all of which are covered by standards. But the one thing you want the most--durability--never reveals itself until the *last day* of the insulator's life. Then, you can count up years of service, and only then! . . . Most station insulators are very much alike on the *first day*, but it's a different story as the years roll by. . . . This fact is significant--most requirements for O-B station insulators come from present users. These companies have their own records where the facts are in black and white, and these records prove that, for what you want the most, and can't specify --performance--turn to O-B.

Ohio Brass

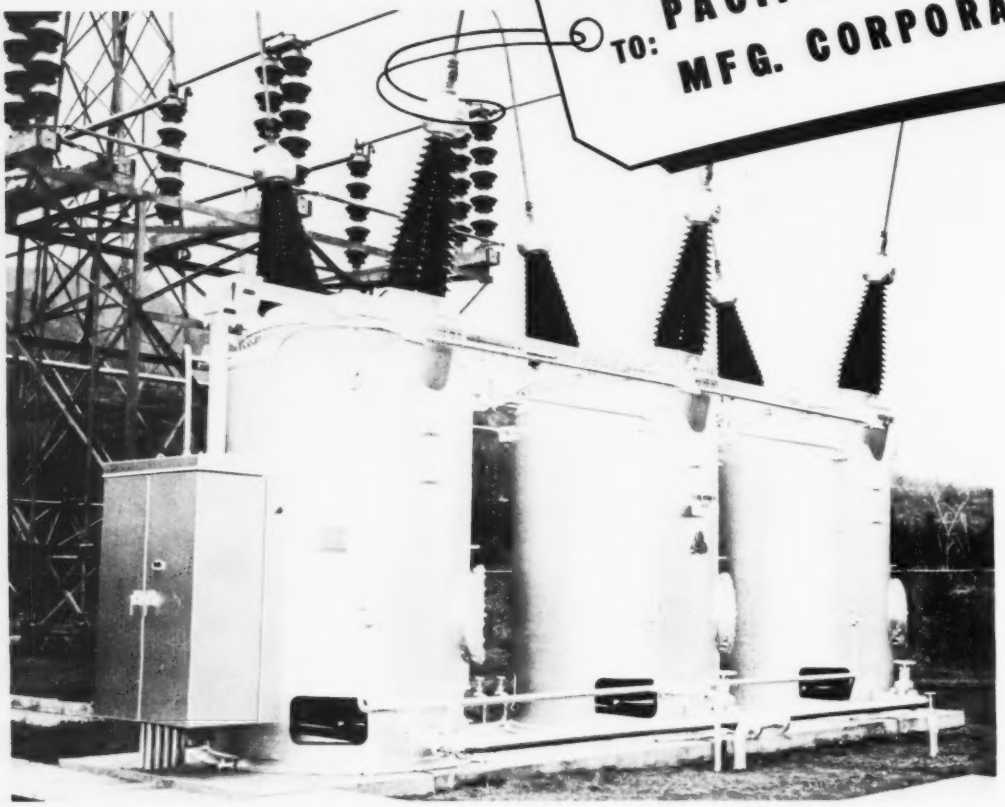
MANSFIELD, OHIO, U.S.A.

OB

HI-TENSION NEWS *Junior*

OHIO BRASS COMPANY
BARBERTON DIVISION - BARBERTON, OHIO, U. S. A.

TO: PACIFIC ELECTRIC MFG. CORPORATION



● One of several three-phase oil circuit breakers supplied to a large Western system by the Pacific Electric Mfg. Corporation. According to the apparatus builder . . . "These breakers are designed for operation on 230-kv lines, have an interrupting capacity of 7,500,000 kva, and carry 1200 amperes continuously. Interrupting time is 3 cycles, closing time 10 cycles, and reclosing time is adjustable as desired from 15 to 45 cycles. Sliding-shoe contacts require no critical adjustment to fix closed position, nor is contact pressure affected by contact wear. Other Pacific Electric features include closing by stored energy of motor-compressed springs, improved arc extinguishment." And . . .

BUSHINGS

one of the finest components of any circuit breaker-

Ohio Brass

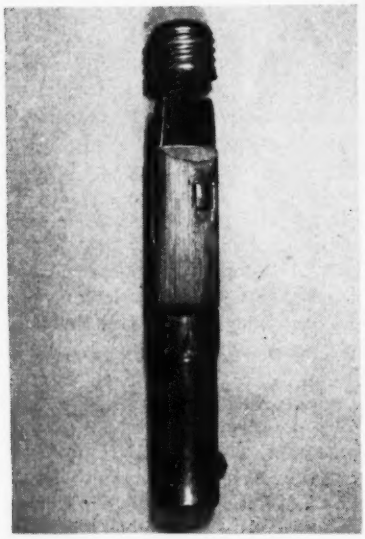
MANSFIELD, OHIO, U. S. A.

4218-HR

Three-Joint Pole

(*Continued from page* 152)

The measuring pole consists of three lengths of 4-ft bamboo fishpole, with a wire hook at the top of the second and third lengths. In measuring clearances, the ring of a 25-ft cloth tape is attached to a two or three-joint pole as necessary. Tip of pole is raised to overhead line and inspector reads exact measurement of clearance at end of tape measure on ground. Tape measure used is cloth and precautions are taken to insure that no metallic threads are woven into it.



Tool Removes Bases of Broken Street Lamps

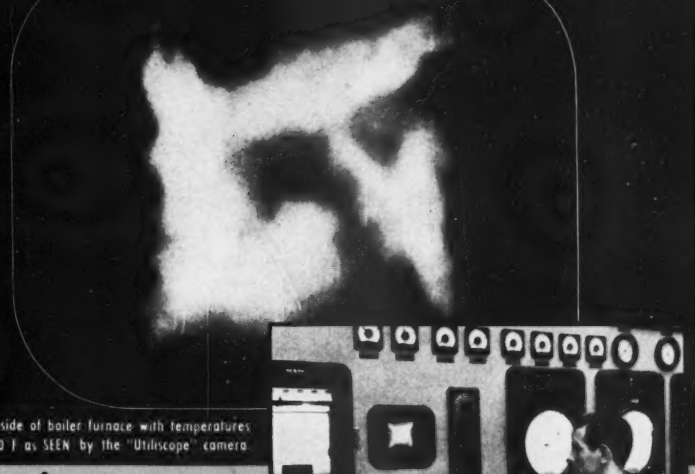
C. M. HOOSER, Distribution Dept, Ohio Power Co, Dennison, Ohio

A tapered-end tool has been devised to overcome the difficulty in removing the bases of broken street-light bulbs. The tool shown is inserted into the base with an adapter that fits a "hot-stick."

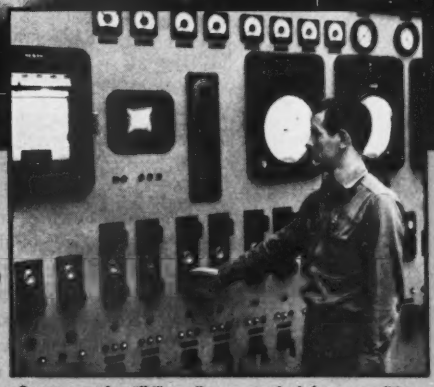
Different width ends are required for removing mogul and medium bases, but in both cases the part engaging the base is made of a piece of 3/32-in. steel 2½ in. long. The piece is tapered slightly to enter the base, and beveled on the sides to grip the base when turned counter-clockwise. For medium bases the end is ¾ in. wide before tapering; for mogul bases the end is 1¼ in. wide. The ends may be changed by removing the counter-sunk bolt.

KEEPING CLOSE WATCH ON

A Suburb of Hell



(Above) Inside of boiler furnace with temperatures up to 3000 F as SEEN by the "Utiliscope" camera



Operator watches "Utiliscope" screen to check furnace conditions.

Again

DIAMOND

"UTILISCOPE"

(WIRED TELEVISION)

Gives Eyes to Instruments

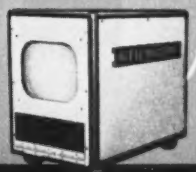
The interior of a big power boiler . . . white hot with flaming powdered coal or fuel oil . . . can't be looked at conveniently. This "suburb of hell" is too hot and too brilliant for the human eye to watch continuously.

But it needs continuous watching. Only VISION can ride herd perfectly on the varying conditions of the raging flame . . . give a "sense of reality" to the control operator. There are plenty of instruments but they can't see.

At the Port Jefferson Power Station of Long Island Lighting Co., each furnace has a "Utiliscope" that looks directly into the fire. On a viewing screen in the centralized control room, the operator can SEE conditions that help in eliminating smoke. He can SEE that the ignition torches are operating satisfactorily before admitting pulverized coal or fuel oil. He can also SEE when ignition takes place during lighting off. On low load operation, he can SEE the stability of the flame.

Many processes and operations in industry need close observation for safe, accurate, and efficient control. But often they are too remote, too inaccessible, too hot, too cold, too dangerous, etc. for direct eye observation. The "Utiliscope" can watch these things . . . bring the image where it is needed. Write for bulletin containing suggestings.

TYPICAL USES — Studying destructive tests of engines • Watching flow of molten steel • Checking remote gauge readings • Viewing nuclear research Coordinating materials flow on conveyors • The "Utiliscope" (Registered U. S. Patent Office)



6062

DIAMOND "UTILISCOPE"

WIRED TELEVISION

WRITE FOR BULLETIN 1028 T

DIAMOND POWER SPECIALTY CORP.

FIRST IN INDUSTRIAL TELEVISION

LANCASTER, OHIO • OFFICES IN 39 PRINCIPAL CITIES

Diamond Specialty Limited—Windsor, Ontario

Since 1903, Diamond has Manufactured Quality Equipment for Industry

L. T. Cale, Alabama Power Co; L. P. Fries, New York State Electric & Gas Co; J. M. Ketch, General Electric Lamp Div; J. J. Powell Mississippi Power & Light Co

J. C. Murtha, Consolidated Edison of New York Inc; R. G. Ely, vice president, Connecticut Light & Power Co; P. H. Torchio, Jr, American Gas & Electric Co; P. D. Lawrence, Virginia Electric Power Co

More Power in Selling—Cont'd from p. 111

mercial Cues" are ready for printing. The single-page bulletins will be issued as companion pieces to the handbook, with particular emphasis on new ideas.

The committee has also completed and is now publishing the fourth in a series of load and revenue studies. This deals with apparel stores. It contains case histories of stores in the small, medium, and large class with before and after load data and showing ultimate potential.

The cooking committee, Sansbury said, has prepared the first issue of a publication to be known as "Current Cooking." It also has completed four data sheets; defined duties of a proposed commercial cooking director as an EEI staff assistant, and has worked toward formation of the second inter-area group formed in the New England area.

Modernization Urged . . . Stating that modernization of commercial premises pays off for everybody concerned, J. C. Murtha, Consolidated Edison Co of New York, said this story can be more effectively brought to customers by bringing together all parties concerned, rather than using the separate efforts of each member of the group.

In support of EEI's Market Development Committee, he called for Modernization Clinics "in which manufacturers of store fronts, counter equipment, paints, floor covering, lighting fixtures, air conditioning equipment, and all the other devices which together are necessary to a complete job, can collaborate with local utilities to present a combined story to commercial customers in a given area."

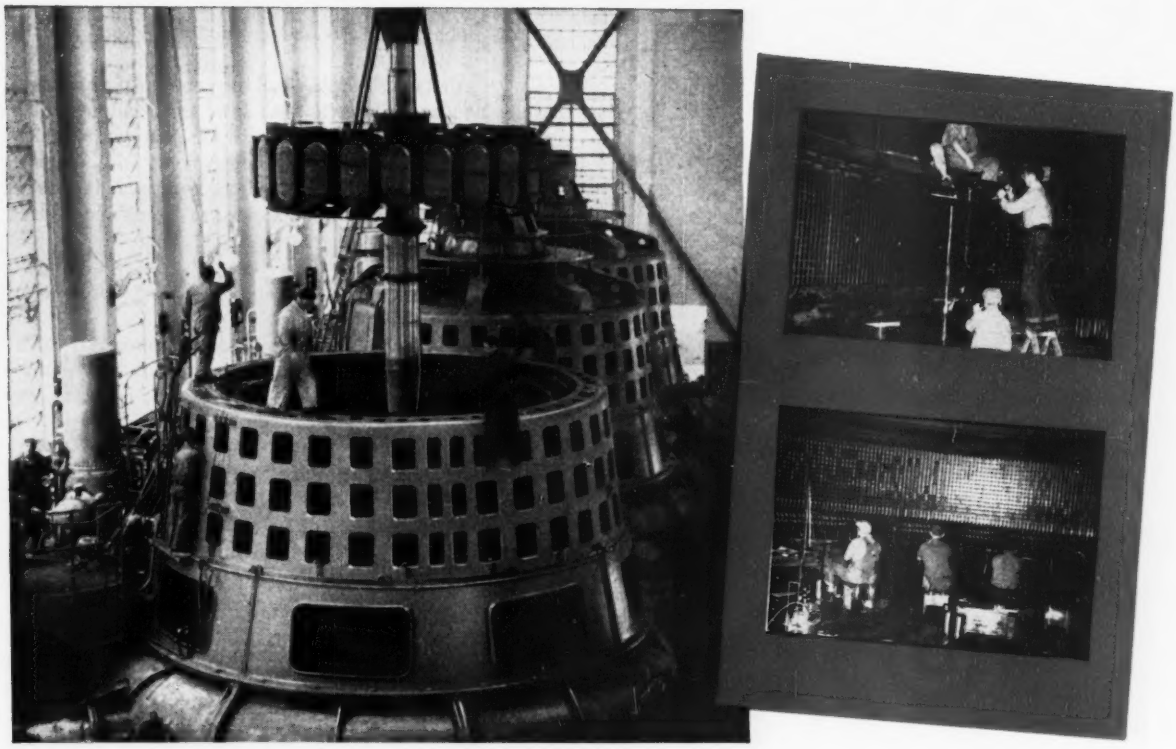
"Modernization clinics," he continued, "should help not only the utility and its customers but by accelerating rate of modernization would contribute toward maintenance of national prosperity . . . and would contribute to utility industrial load growth."

Business Schooling . . . Work of the Michigan State College Division of Hotel, Restaurant, and General Institutional Management was described by its director, Leslie W. Scott. Administered by the School of Business, the division teaches commercial students many courses relating to hotel and restaurant management. Included is a series of food selection courses,—meat products, poultry products, dairy products, and fruits and vegetables, and another in groceries and packaged foods.

Courses in mechanical and electrical engineering as

B. F. Shields, residential sales manager, J. S. Bartlett, general sales manager, and J. C. Melton, commercial sales supervisor, all of Potomac Electric Power Co.

W. M. Longman, Central Surveys, Inc; Tom G. Allan, West Penn Power Co; Paul Penfield, Detroit Edison Co; Charles E. Parker, Central Surveys, Inc, consider customer reactions



generator windings

with a *Longer* life span

Throughout the country, large generators are turning out more power as a result of National redesign work, National replacement windings and National rebuilding. In many cases, electrical characteristics have been changed to meet changed needs. In others, power output has been increased to meet increased demands. In still others, recurring trouble has been eliminated. In all cases, long life is assured. From the simplest replacement coil to the most complicated redesign job, National Electric Coil is dedicated not only to maintenance but also to *improvement*. When *any* piece of rotating electrical equipment presents a problem, communicate with National.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

M. S. Angier, Westinghouse Electric Corp; C. W. Hayward, Public Service of Colorado; R. H. Thach, Westinghouse Electric Corp; R. B. Hubbard, Rocky Mountain Electric League

Speakers and Chairman—George E. Duerr, West Penn Power Co; Frank E. Wiatt, Cincinnati Gas & Electric Co; Don Russell, Factory Stores, Inc.—all speakers; P. W. McCormick, Union Electric Co, Chairman, Competitive Service Committee Industrial Power and Heating Section

applied to the hotel business are required. Others are hotel housekeeping, law, merchandising, accounting, and front office procedure.

The work is carried on at the College's $2 million Kellogg Center toward the building of which the hotel and restaurant industry contributed $100,000. Adult education work supplementing day-school instruction include a Restaurant Operators Clinic and a Food Sanitation Conference. Planned for the future are a Hotel Sales Clinic, summer courses in work simplification for food service people, and another for industrial cafeteria operators.

Commercial Lighting . . . A warning that we are entering a period when new commercial building itself can no longer be depended upon to sustain a satisfactory commercial lighting load growth was sounded by R. W. Butts, chairman of EEI's Commercial Lighting Committee. Speaking before the commercial sales section, Butts indicated that much of the commercial lighting load building progress in the past decade "is directly attributable to the stepped-up commercial building."

During this period, he said, a limited amount of sales effort was directed at the commercial relighting market, toward which more sales and promotional effort must be directed in the future.

Toward that end, Butts added, the committee he heads is developing a commercial lighting sales organization manual designed to assist members companies in their consideration of more effective lighting sales departments and organization setups. He also touched on the proposed new commercial lighting certification program of Nema's Industrial and Commercial Lighting Equipment Section Market Research Committee. It will establish a set of minimum standards around which an aggressive sales promotion program can be developed.

"From actual survey," Butts stated, "commercial lighting load can, during the next ten years, double that presently connected on all utility systems." However, he cautioned that the reverse can also become a reality.

Commercial Cooking . . . One of the newer developments in commercial cooking sales work—inter-area information groups—was the subject of a talk by H. M. Blackburn, commercial cooking specialist, Potomac Electric Power Co. He described the first of such groups formed at the tag end of 1950 by cooking representatives from eight utilities in the Middle Atlantic states.

Purpose of its meetings, Blackburn said, is to exchange sales campaign data, data on lists of new installations, design and layout ideas, visual material, and equipment performance experiences. During the informal meetings, members contribute their ideas, talk about their problems, and call attention to new products.

Some of the subjects discussed are promotional literature, regional shows and exhibits, service procedure, maintenance problems, dealer relations, programs for restaurant association meetings, and equipment performances.

Manufacturers have been called in at times and have listened to suggestions on improvement of product, product literature, or of servicing arrangements. The inter-area group is even given the opportunity to comment on new equipment before it is offered for sale, and at present, several pieces are being field-tested in the group's territory.

Street Lighting . . . New, revised "American Standard Practice for Street and Highway Lighting" was reviewed by Charles H. Rex, development engineer, General Electric Co. The 1953 edition, he stated, includes clarifications and additions that have been made as a result of five years' work by the Illuminating Engineering Society Committee on Street and Highway Lighting.

Proper types of luminaire light distribution which are essential for efficient roadway lighting are emphasized, while an appendix section discusses the factors in seeing and visibility.

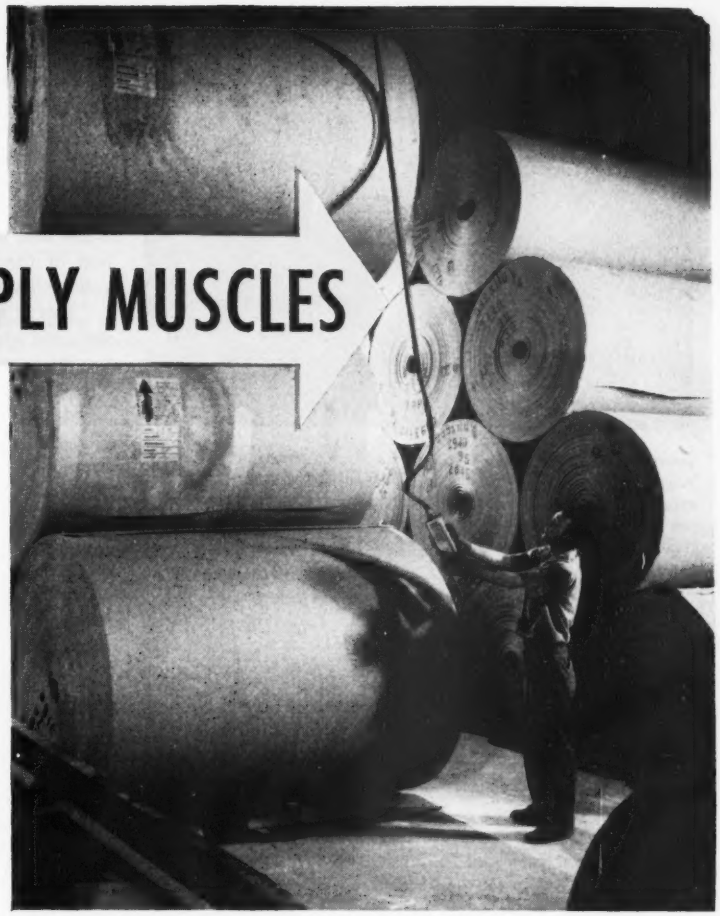
Farm Section

A power company should take a special interest in all major types of producers—particularly agricultural—in its service area, Roy W. Godley, agricultural counsel, Kroger Co, told the farm section group.

"By interest," he said, "I mean staff personnel who know the business of the producers—whose duty it is to help the producers do a better job in producing and marketing."

That's how best to make a fair rate on investment in

HOW TO MULTIPLY MUSCLES



These huge rolls of paper are lifted off delivery trucks and put into the stock piles as easily as though they were spools of thread. It's only another example of how we multiply muscle power with electric muscles. Here an overhead crane operated and controlled by push buttons in the hands of this workman responds like a genie to every direction.

This is only another of the many jobs that TIREX Portable Cords do so well. This pendant control station may be banged around; it is subject to abrasion and to strains of one kind and another. Even oil dripping from the crane may get on this cord. Yet day after day, week after week, even year after year, TIREX Cords give dependable, satisfactory service. Isn't that what you want when you buy a cord? We think so too.

Why don't you buy some TIREX for that difficult job you have and prove to yourself that TIREX lasts and lasts. Get it from your local distributor. He has most sizes in stock. Be sure, though, that you get genuine Simplex-TIREX with the special neoprene armor that is cured in lead.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO.

79 Sidney Street, Cambridge 39, Mass.

Speakers and Chairman—Bruce Fleming, vice president, Edwin L. Wiegand Co and H. Carl Bauman, Chemical Construction Corp, both speakers: Maxwell Cole, Philadelphia Electric Co and Chairman of the Industrial Power and Heating Section; S. L. Drumm, vice president, New Orleans Public Service Inc

More Power in Selling—Contd. from p. 160

farm electrification, he added. That this adjunct of the power field has become big business is proven, he stated, by the fact that by 1951 more than $6½ billion had been invested in rural electrification by power suppliers.

"If you will look over your member companies," Godley said, "you will find that those that have put real effort in the field of agricultural development can prove that it has been a good investment."

Youth Program . . . One way to develop that market is to work more closely with farm youth, according to Guy L. Noble, director, National Committee on Boys and Girls Club Work.

By doing so, utilities can contact them at a time when their habits and attitudes are being formed, when they are learning new things most rapidly, prior to the time they take on the responsibility of a family. Lastly, they contact folks who have skill, know the meaning of success, the value of a dollar, and who are the finest kind of prospects not as future customers but customers at the moment.

As of March 1, he added, there were 425 power suppliers cooperating in the 4-H Farm and Home Electric program, 175 of them being utilities and 250 being cooperatives. In eight states suppliers invest about $50,000 a year, not including the time of personnel. Since the program started 17 years ago, enrollment has jumped to nearly 80,000.

The type of assistance given young people, Noble said, breaks down into four categories:

1. Assisting with program planning and development of literature.

2. Training 4-H leaders—thirty states have such programs.

3. Cooperating with the agricultural extension services in assisting with field work. Help ranges from summer camp work, serving on county fair committees, assisting with exhibits, and judging round-up events.

4. Encouraging the program through advertising, publicity, window displays, and special recognition events.

New Vistas . . . In opening remarks at the session, E. D. Smith, chairman of EEI's Farm Section, warned utilities they should never become complacent about the job they are doing or have done.

"Use of electric energy on farms," he said, "is in a period of basic research in which even the horizons are not yet in sight. It is an open frontier in which the wildest dream contains the seed of reason and possible fulfillment."

He told his listeners that they should lament the migration of the best minds—the most energetic of our farm youth—from the farm to the city.

"This is an indication," he said, "that our farms lack a sufficient challenge to their minds and a sufficient reward for their energies."

Electricity is in a position to provide a type of farming, he added, that will offer a challenge to the best of them.

Farm Equipment Potentials . . . "Increasing use of electricity to do farm work and to increase farm operation efficiency will probably be the most outstanding agricultural achievement of the current decade," said Paul W. Chapman, associate dean of agriculture, University of Georgia.

Supporting this conclusion was a convincing amount of data on numerous farm uses, cited by Chapman. Local dealers, he remarked, seem to be the key people in extending such uses. It must be made easier in all localities for farmers to get both equipment and necessary information about installing and using it.

The Farm Challenge . . . A goal of 70 billion kwhr used annually on American farms by 1970 was set by E. O. George, Detroit Edison, in his paper, "Opportunities Unlimited." Utility rural service departments, he said, must look beyond the problems and obstacles in the way of farm electrification and see its opportunities. Declining farm prices, cost of farm labor, and competition of LP gas are challenges that must be met by showing the farmer how he can make more money by using more electricity.

To do this, utilities must maintain rural service departments of capable, well-trained personnel to reflect policies accurately, meet competition aggressively, assume leadership in community affairs willingly, provide for customers' needs adequately, and work against unfavorable influences intelligently.

(*Continued on page* 164)

Glen S. Young, Kansas City Power & Light Co; W. Paul Lyman, Carolina Power & Light Co; H. Chester Gause, Alabama Power Co

EASY . . . INEXPENSIVE TO POST-FORM THESE PARTS WITH

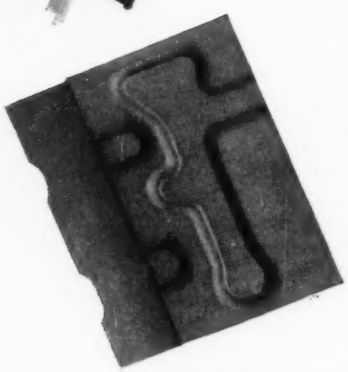
New DILECTO CF-1

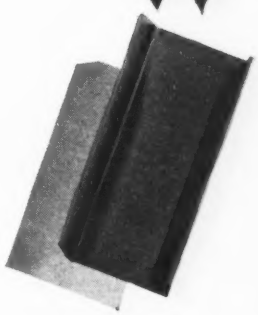
- ***Non-After-Glow characteristic***
- ***A canvas-based laminate***
- ***Post-Forms to shapes in inexpensive cold molds***
- ***Excellent mechanical strength***
- ***Resists abrasion, has long life***
- ***Easily machined and punched***

Where can you use this new canvas-based C-D-F "Post-Forming" Dilecto grade CF-1? Presently it's used for a multitude of aircraft and semi-structural parts . . . as ribbed panels, fan blades and ammunition bay liners, guards and cover frames . . . as ventilating ducts, battery box containers . . . switch covers, thermostat mounting plates, etc. CF-1 has a tremendous potential in electrical as well as other industries because of its strength and light weight.

"Post-Forming" Dilecto CF-1 is easy to work with. Heated until pliable with infra-red, electric ovens, strip heaters or hot plates, or immersed in molten alloys or hot oil, it is then quickly placed in a cold mold and pressed or formed until cold enough to retain the desired shape. Inexpensive molds can be made from hard wood, cast or laminated plastics, steel and metal alloys. Normally C-D-F supplies Dilecto CF-1 in sheets from 1/32" to 1/4" thicknesses.

C-D-F's sales engineers (offices in principal cities) will cooperate with your designers and production experts. C-D-F also forms and fabricates Dilecto to your specifications. Write for technical bulletins describing Dilecto CF-1 as well as other grades of Post-Forming Dilecto.





NON-AFTER-GLOW — Post-Forming Dilecto CF-1 incorporates special chemicals in the varnish that produce no apparent after-glow once an ignited specimen has been extinguished. This product complies with the SAE-Aeronautical Material Specification AMS-3605, latest revision.

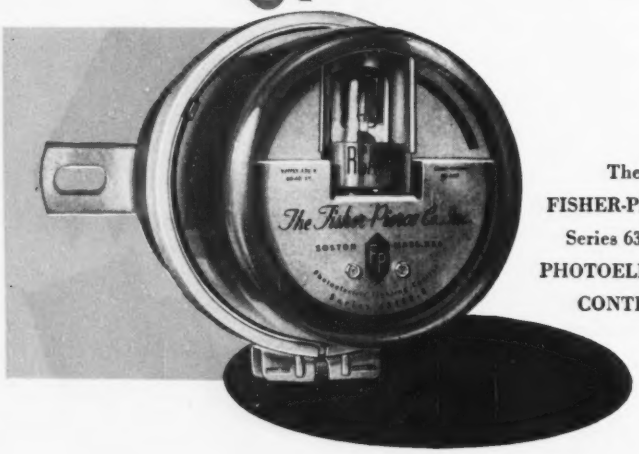
SILICONES, TOO — C-D-F offers other post-forming grades of laminated Dilecto: Grade GB-SF is a glass-base Silicone laminate furnished in a semi-cured state for forming pieces where high heat resistance and low dielectric losses are required. Can be formed into armature slot insulators, rectangular coil forms, primary-secondary cylindrical or rectangular insulators for dry type transfomers, etc. Grade XF Dilecto is a paper-base grade for mechanical applications where electrical properties are secondary.

THE NAME TO REMEMBER FOR POST-FORMING DILECTO LAMINATED PLASTICS

Continental-Diamond Fibre Company

NEWARK 15, DELAWARE

for positive control of street lighting



The FISHER-PIERCE Series 63300B PHOTOELECTRIC CONTROL

PHOTOELECTRIC CONTROL means the added *safety* of street lighting *when it is needed* — regardless of time of day, season, climate or weather conditions. Control is fully automatic. Even after temporary line power failures the control operates correctly with no need for manual resetting.

FISHER-PIERCE Photoelectric Controls for street lighting have proven themselves in over 35,000 installations made by more than 700 electric utilities.

The electronic circuit of the Series 63300B control provides dependability made possible by over seven years of practical experience. Amplifier tubes consistently have a life of more than 20,000 hours. Other components have much longer life. Units are rated 2500 V.rms hipot to give maximum resistance to the effects of lightning transients. The built-in contactor is conservatively rated to handle a 3000 watt lighting load. The unit has Standard meter socket plug-in construction with cross-arm mounting bracket which gives great installation flexibility.

The control itself gives *truly* economical (*low* purchase cost, *low* installation cost and *low* maintenance cost) and effective service backed by an extensive engineering service organization field experienced in street light control application.

Write for Bulletin 63300B.

The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.

More Power in Selling

(*Continued from page* 162)

Industrial Sales Section

A strong sentiment has developed during the year that we are entering a new period of the business cycle in which will occur a definite slackening of industrial activity in both the consumer and durable goods fields. If this is true, said Maxwell Cole, Philadelphia Electric Co and chairman of the EEI Industrial Power and Heating Section, in order to continue our growth and to provide load for new capacity, it will be necessary to intensify our sales and promotional efforts to increase their effectiveness.

In order to keep our systems satisfactorily loaded we are going to have to study our markets for increased industrial electrification, intensify our efforts to achieve wider fields of usefulness for existing applications, and then go out and sell them.

Anticipate Customer Needs . . . We must not only meet the immediate needs of our customers, but we should anticipate these needs before the customer realizes they exist, according to Frank E. Wiatt, Cincinnati Gas & Electric Co. He said that lack of imagination and aggressive spirit may result in some other method being used and some other industry securing business that rightfully should be ours. We must sell aggressively at all times if we are to maintain the overall load characteristics which we need. By selective selling we can produce business which has desirable characteristics and which will offset the undesirable effects of "gravity business."

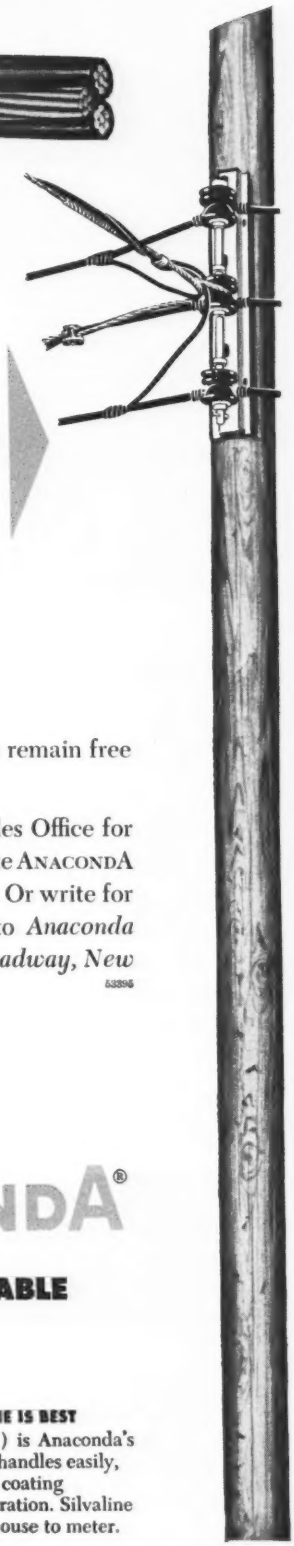
In-Plant Feeding . . . According to Don Russell, Factory Stores, Inc, workers having hot lunches and snacks produce 192 work units compared with 183 work units for workers having hot lunches and no snacks. He said that a similar effect was noted in the accident records of industrial plants.

Energy Use Forecast . . . D. C. Hooper, Westinghouse Electric Corp, presented a complete forecast of use of electric energy by industries. He said that production manhours in 1962 will be less than in 1952 and that modernization of production facilities must be stepped up. A 20% increase in production per manhour requires a

ANACONDA Type N-SD

Service Drop Cable with copper or aluminum conductors

YOUR CHOICE OF INSULATIONS:
neoprene
polyethylene



overall cost is lowered

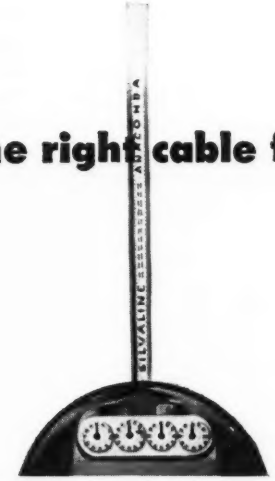
from pole

to weatherhead

TO HELP CUT THE COST of service connections, Anaconda now offers an outstanding service drop cable. This ANACONDA Cable is highly dependable . . . durable . . . and extremely weather-resistant.

TWO INSULATED CONDUCTORS are wrapped around a bare neutral messenger so that the full support of the assembly is borne by the messenger wire. The conductors remain free of tension.

ASK YOUR NEAREST Anaconda Sales Office for full information on this up-to-date ANACONDA Type N-SD Service Drop Cable. Or write for descriptive Bulletin DM-5121 to *Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.* 53396



the right cable for the job ANACONDA®

WIRE AND CABLE

FROM WEATHERHEAD TO METER, SILVALINE IS BEST
Weatherproof Silvaline* (URC Type SE) is Anaconda's completely new service entrance cable. It handles easily, offers long service life, and its silver finish coating may be painted without danger of discoloration. Silvaline is approved for installation from pole to house to meter.
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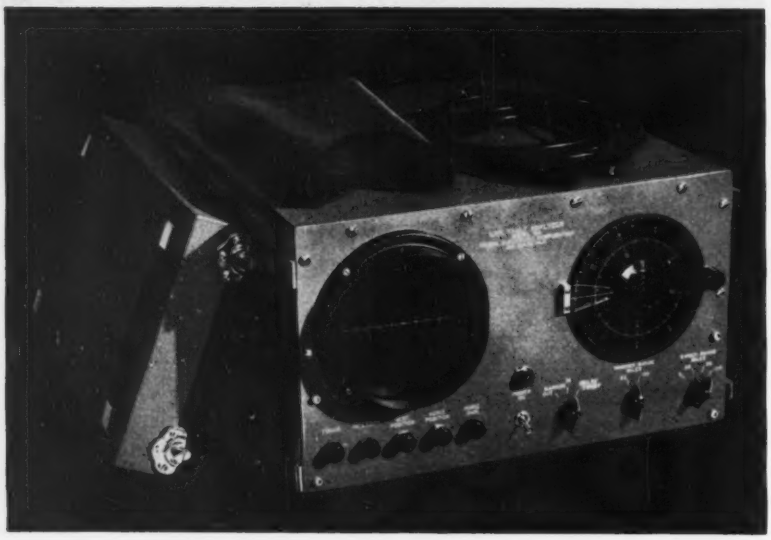
Locate line faults instantly at ranges 1/2 to 200 miles



Model 124 Line Fault Analyzer

Now you can locate power, telephone or telegraph line faults instantly and accurately under all weather conditions. Sierra Model 124 Analyzer eliminates virtually all lost time, hard work and hazard of finding breaks, shorts, opens or other discontinuities. Operating from a powerhouse, transformer bank, substation or terminal point, it pinpoints faults from ½ to 200 miles away with accuracy of ±1 mile on the 200 mile range.

The Analyzer operates on radar techniques, sending a high amplitude pulse along a conductor and presenting echoes from discontinuities as pips on a radar-type "A" scope. Operation is extremely simple, and distances are read direct in miles. Calibrated sweep ranges of 5, 25, 50 and 100 miles are provided. A sweep delay extends range to 200 miles, or permits line segments as small as five miles to be presented full-screen. A movable distance marker can be ranged from 5 to 100 miles.

Model 124 weighs just 59 pounds; and is completely contained in a weatherproofed carrying case. ***Price $795.00 f.o.b. factory.***

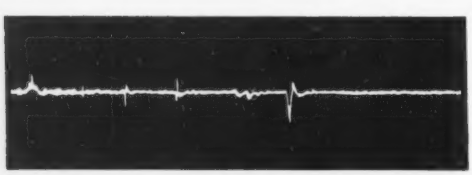


Figure 1

Test on 60 kv line, instrument on 100-mile sweep. Negative pip to right of center indicates line grounded at 60 miles. Other pips are switchyards, transformer bank, substation tap, carrier coupling capacitor, change in line configuration.

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For complete details, see your Sierra sales representative or write direct for Bulletin 102B

sierra

Sierra Electronic Corporation
San Carlos, California, U.S.A.
Sales representatives in major cities

Manufacturers of Carrier Frequency Voltmeters, Wave Analyzers, Directional Couplers, Wide-Band RF Transformers, Custom Radio Transmitters.

40% increase in kwhr, Hooper stated. Utilities and manufacturers should direct their major sales efforts to industries which use a small amount of electric energy per manhour.

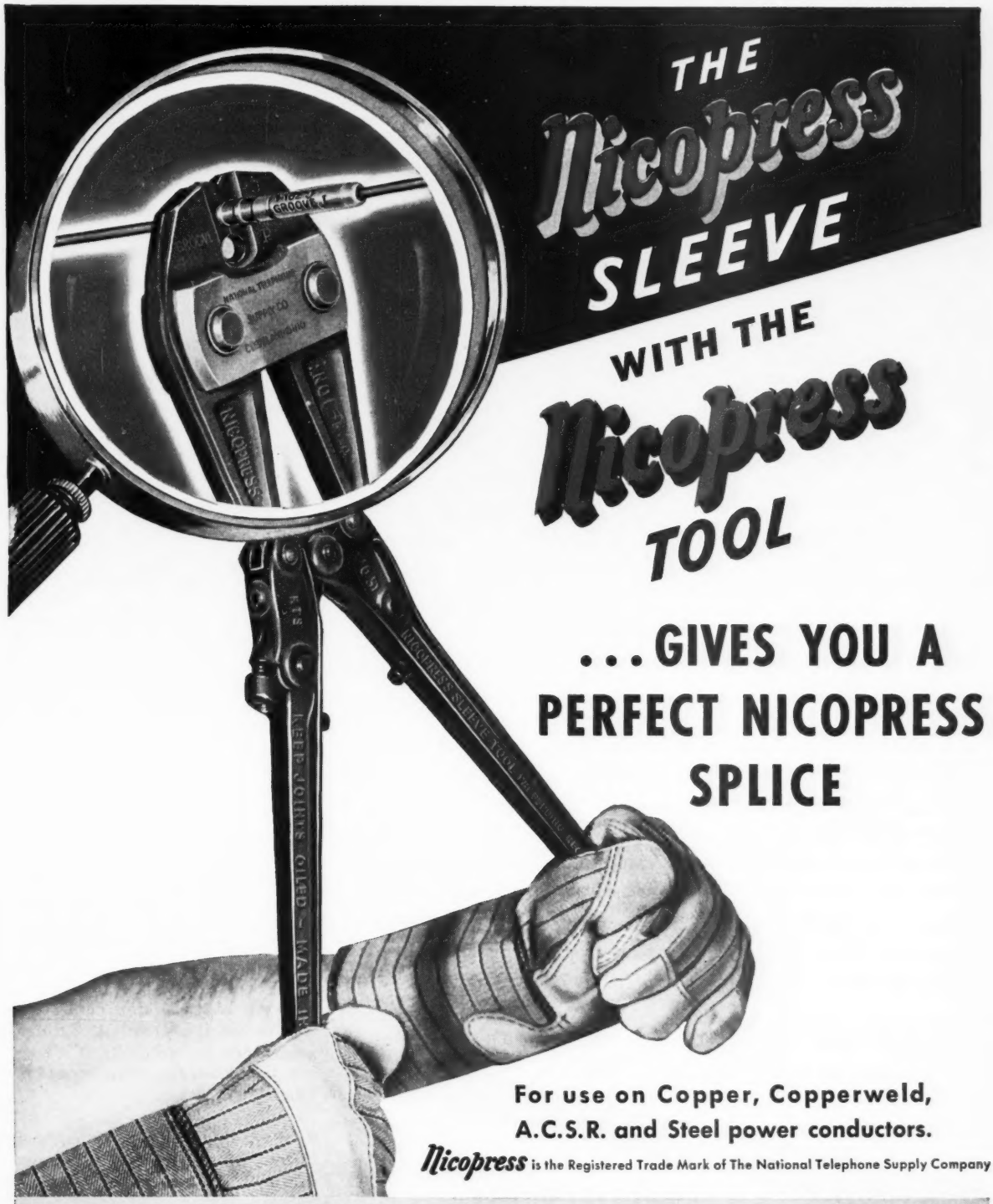
Mass Selling . . . West Penn Power Co's experiences in "mass selling" by holding 11 electric heating meetings with groups of customers were outlined by George E. Duerr. He said that such mass selling taught his company that it must "take the show to its customers—not ask them to come to us." We must give them lots of "how to" stories, take the mystery out of electric heat.

There must be no tinge of "commercialism" in what we say or do. Fancy props or backgrounds detract instead of add to the objective. A coffee and doughnut period gives bashful members an opportunity to ask questions after class.

Duerr said that mass selling methods help keep sales costs low enough to make this new business highly profitable by shortening the time required to make a sale. He advised the use of low-cost, metal-sheath heaters to prove the advantages of electric heat and thus make customers receptive to sales arguments when larger heating jobs are tackled.

Chemical Industry . . . Trends in the chemical industry indicate that more power tends to be purchased than generated, stated H. Carl Bauman, Chemical Construction Corp. He said that this picture may change somewhat, depending largely on the processes used by the chemical industry in the future. The rate of growth of public utility power is considerably greater than that for industrial power, he said.

Future With Utilities . . . We should stop talking about the security the electric utility industry offers and talk more of the big money possibilities. This is the opinion of S. J. Drumm, vice president, New Orleans Public Service, Inc. He said the college men we want are interested in the training we can give them; so let's talk more of growth potentials and how they will be helped in this direction by orientation and continuous training programs. Drumm stated that it is difficult enough to find just an engineer. The difficulty becomes compounded when we seek an engineer with the faculty for dealing with people in sales situations.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PERFECT NICOPRESS
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be sure of

UNIFORMITY. . . use

BERMICO® FIBRE CONDUIT

Uniform wall thickness • *Uniform* diameter of bore • *Uniform* impregnation • *Uniform* quality of fibre.

Automatic forming and processing . . . close controls over the drying process . . . machining of taper and length . . . four rigid factory inspections—these are the things that guarantee Bermico's uniformity of dimensions, specifications and quality.

For surest cable protection, be sure to specify Bermico Fibre Conduit. Made by Brown Company from sturdy wood fibre, impregnated with pitch, it is—

• Light • Tight • Strong • Smooth Inside and Out
• Acid-Resistant • Waterproof

distributed by
WESTINGHOUSE
Electric Supply Company. Offices in principal cities

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SOLKA ▲ CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS
NIBROC TOILET TISSUE • BERMICO SEWER PIPE, CONDUIT ▲ CORES • ONCO INSOLES • CHEMICALS

INDUSTRIAL BRIEFS

Aluminum billet heating in 425-kva induction oven has proved more satisfactory, more efficient and much faster than previous method (gas fired billet oven) at Alumiwal Corp., Gnadenhutten, O. The 6 in. x 30 in. billets are raised from room temperature to 850 F in 100 sec and conveyed to extrusion press immediately. 360 kvar of shunt capacitors are installed. R. W. Hunt, Commercial Sales Rep., Ohio Power Co., Dennison, O.

Plant growth control (photoperiodism)—the phenomenon by which flowering of certain plants is affected by artificial lighting, is used by Yoder Brothers Co. in greenhouses at Erie, Pa. Growth can be controlled to suit changing market and demand for plants throughout the year. Chrysanthemum budding is promoted during dark night period. By interrupting this period with light, flowering response is reversed. Greenhouse area exceeds seven acres with over 1400-300-w incandescent lamps in use. Nightly burning period for lamps varies from 1 to 4 hr before and after midnight, depending on whether plant growth should be accelerated or retarded. G. W. Cannon, Industrial Eng., Pennsylvania Electric Co., Erie, Pa.

Heating gate of ash hopper with 2-500-w strip heaters and bottom of chute with 600-w of soil heating cable at Poor & Co, Canton, Ohio, has eliminated freezing and speeded ash removal. Many manhours are also saved. Ashes are conveyed from boiler to ash hopper by steam jet. Previously the condensed steam froze during cold weather and made removal of frozen ashes almost impossible. G. W. Craiglow, Ind. Power Eng. Ohio Power Co, Canton, O.

Refrigeration of meat trucks has been speeded and costs cut 30% at Winner Packing Co., Lock Haven, Pa. Electrically driven compressors installed in all trucks are plugged into bank of power outlets. Truck interiors are brought up to proper temperature during idle periods. Motors are 3 hp, 3 phase, 230 v. Average nightly load is 30 kw. System replaces ice cakes previously used in trucks. K. H. Breon, Industrial Rep., Pennsylvania Power & Light Co., Williamsport, Pa.

RCA MICROWAVE

Over the years RCA MICROWAVE has proved it stays in service when you need communication most.

Most practical system, most complete service

To get the most from your microwave investment, check the record for downright dependability—and you'll specify RCA MICROWAVE.

For example, check the operating records of RCA MICROWAVE systems over the years. Check RCA's long history of successful operation through every kind of weather. Or check the numerous RCA installations that are now providing continuity of service in many applications. RCA can offer you a long working record of dependability.

For complete Service, check RCA's survey, construction, and installation facilities. They're complete single-source, single-responsibility service.

For more speed, for improved operation, check RCA Communication Equipment for your business. Contact your local RCA Regional Office for information, or *mail coupon now.*

Check RCA 2-way radio for downright dependability in mobile communications.

And remember, only RCA can provide the nationwide service facilities of the RCA Service Company.

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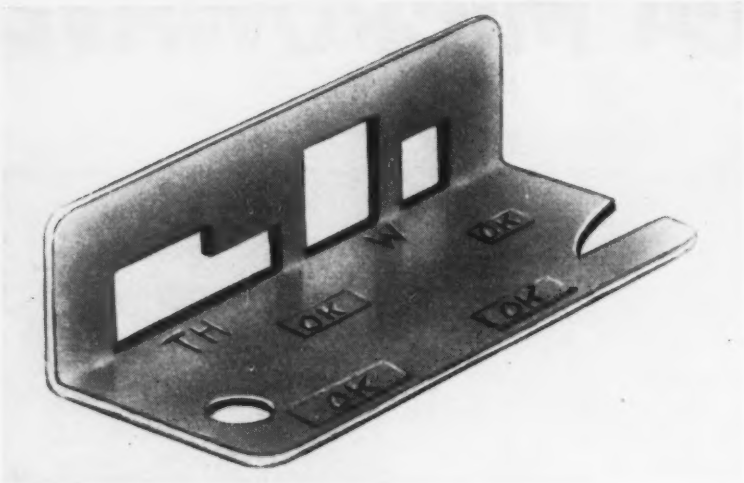
NEW EQUIPMENT

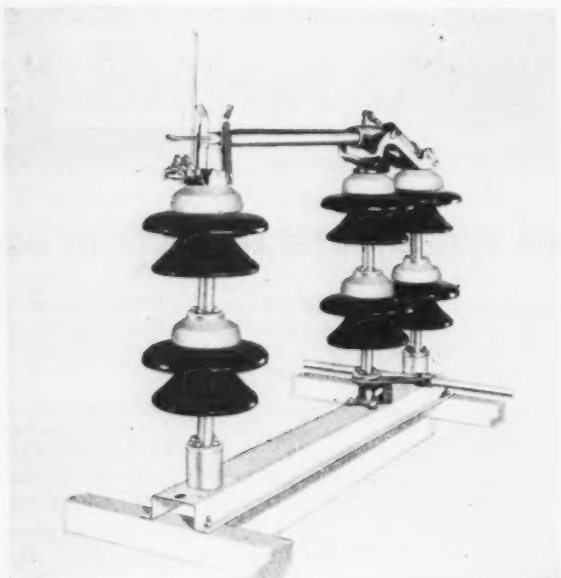


Gaff Gauge

Used for maintenance of linemen's climbers, the gauge is said to accurately check gaffs six ways. Slots that the gaffs are inserted into to check width and thickness are cut in the short side of "L". Reference blocks stamped "OK" determine whether dimensions are satisfactory. Gaff length is checked to a reference line on the reverse side. A profile slot checks the shape of gaff point.

The gauge is made of cold rolled steel with a polished chromium plating.

Fargo Manufacturing Co, Inc, Poughkeepsie, N. Y.



Stack Switch

Designated type H, the rotating stack switch features a hinged end blade that maintains high pressure contact. The hinge contact is completely enclosed to protect it from the elements.

Switch blade rotates while opening and closing. Ribs on the switch clips lock the switch blade in position under short circuits, it is claimed. Weight of blades on switches for 69 kv and above is counterbalanced by enclosed compression spring.

Type H has three moving parts and is designed for switching operations from 7.5 through 230 kv, 400 to 1,200 amp. It is said to have low radio and TV influence rating, and is adaptable to any type of structure.

A. B. Chance Co, Centralia, Mo.

Voltage Booster

For three-phase industrial power lines, the new booster will add 10% manually and 10% more automatically, maintaining the voltage within 0.5% of that desired. Claimed not to distort either the phase or waveform, the voltage boosters are said to be unaffected by the system power factor.

It is made in portable or stationary types, horizontal or vertical for indoor, outdoor or underground use in sizes from 50 to 500 kva and voltages of 240, 480 and 2400 v.

Clark Electronic Laboratories, Palm Springs, Calif.

Secondary Racks Built on the Job...

with

HUBBARD

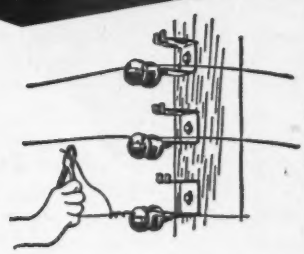
SAGGER BRACKETS

No. 710
HOT GALVANIZED

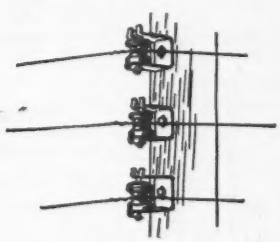
When special problems arise in secondary distribution . . . Hubbard Patented Sagger Brackets furnish a simple solution. They can be mounted in any spacing available, in any number required. Maximum strength is developed by positioning the installation bolt directly in line with the conductor.

The insulator rotates freely about the bolt, and when in sagging position acts as a wire stringing tool. When the correct sag has been set, the conductor is tied in and the insulator is snapped into vertical position over the two keeper lugs.

Typical Application



No. 710 becomes an effective wire stringing tool when in the horizontal, or sagging position. Conductors are strung, sagged and tied in while the insulator is in the horizontal position.



Units may be mounted at any spacing and in whatever numbers circumstances require. No. 710 affords a particular solution to those "special" problems.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

SHAWMUT
Amp-trap®
Super-Current Slayer
Here are just a few of those who use Amp-trap to prevent the development of heavy short-circuit currents. Lightning fast Amp-trap with its Interrupting Rating of 100,000 Amperes R.M.S. at 600 Volts and below, saves them money. It provides complete and positive short-circuit protection at lowest cost and permits the safe, quick and economical expansion of existing power circuits. It will pay you to investigate Amp-trap. Do it now. Write for Amp-trap bulletin and ask for prices.

In Canada—POWERLITE DEVICES Ltd., Toronto & Montreal

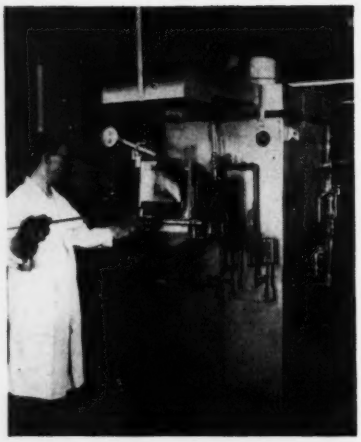
OUR 60th YEAR — Est. 1893

AMP-TRAPS—"Awake At The Switch"

THE CHASE-SHAWMUT CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Amp-trap · Tri-onic · t-d · C-O-T · Trionet · one-O-T type · FUSE WIRE

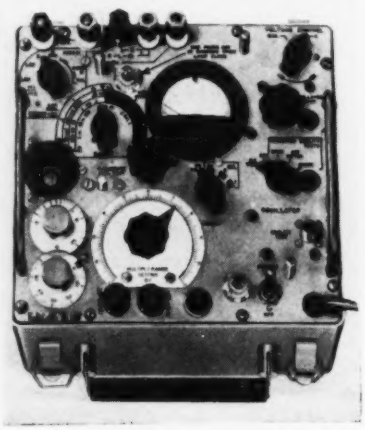


Heat Treating Furnace

Temperatures up to 3,100 F can be obtained in this furnace. It has heating elements formed from molybdenum alloy rod into sinuous loops and supported on alundum refractories. The hearth is made of molybdenum alloy.

A water jacketed chamber permits work to be cooled as well as heated in a protective atmosphere. The furnace is designed for use of either hydrogen or dissociated ammonia. Four manually operated, counter balanced doors on the furnace separate its charging, heating and cooling chambers.

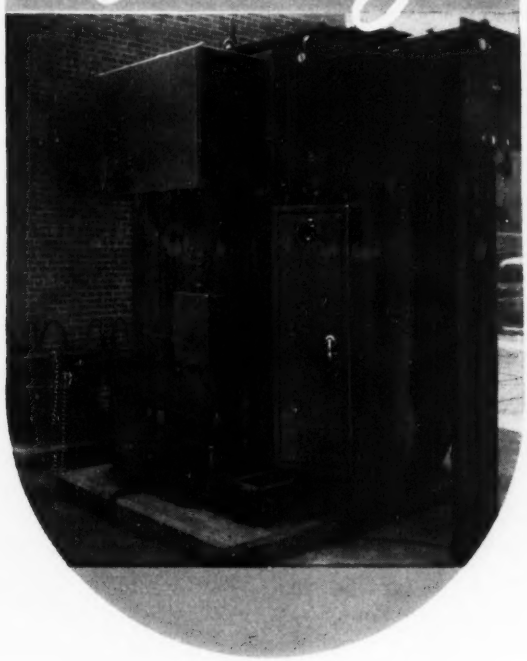
Westinghouse Electric Corp, Pittsburgh 30, Pa.



CRI Bridge

Model 712, capacity-resistance-inductance, bridge measures capacitance of paper, mica, electrolytic, ceramic, and air capacitors; stray capacitance of bushings, switches, wiring; leakage capacitance; resistance of composition

PENNSYLVANIA LOAD RATIO CONTROL EQUIPMENT OPERATES *Quietly*



2500 Kva, 3 Phase, 60 Cycles,
11700 Delta — 2400 Delta/4160Y volts.

Manufacturers of Load Ratio Control Equipment have long concentrated their attention on designing a snap action tap changer mechanism that would operate quietly.

Pennsylvania tackled this problem a number of years ago and in 1949 perfected the *Silent Snap Switch.* Millions of "in the field" operations have verified its sound design principles and fine construction.

The Silent Snap Switch moves swiftly and quietly in response to the demands of the automatic control mechanism. Voltages are raised or lowered in comparative silence.

High among the advantages of quiet tap changing operation are the following:

1. less wear and tear on the equipment;
2. no breakdowns from mechanical impact;
3. longer and more satisfactory tap changing mechanism life.

Quiet Load Ratio Control transformers are especially desirable for installation in residential areas where undue noise, and the clanging and banging formerly associated with the operation of underload tap changing equipment are extremely objectionable.

Pennsylvania Load Ratio Control transformers with the Silent Snap tap changing action are available in sizes up to 7500 Kva and in all voltages.

For complete information, write Pennsylvania Transformer Company, Canonsburg, Pa., and ask for Catalog 5112.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • Canonsburg, Pa.

For high voltage power users—

Jefferson STEP DOWN Transformers

- Compact size for easy, out-of-the-way installations
- Mounts at point of use
- Quickly relocated at any time
- Dry Type—Air Cooled (No fire hazard)

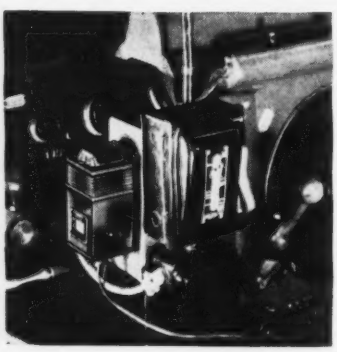
CUT COSTS—

increase electrical efficiency

Installing Jefferson Power Circuit Transformers close to the load, improves voltage regulation, eliminates secondary voltage drop. You save copper and conduit by eliminating long runs of low voltage (115–230) secondary feeders. Being AIR COOLED there are no valves, gaskets or mechanical parts requiring constant maintenance. Jefferson Transformers are compact and lightweight and can readily be relocated if wiring or machinery layouts are altered.

All Jefferson Transformers are equipped with sturdy brackets for mounting directly on machinery or near point of low voltage use. Adequate wiring compartments with ½" and ¾" knockouts are provided. Listed by Underwriters' Laboratories, Inc. *Write for Bulletin 501-15.*

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

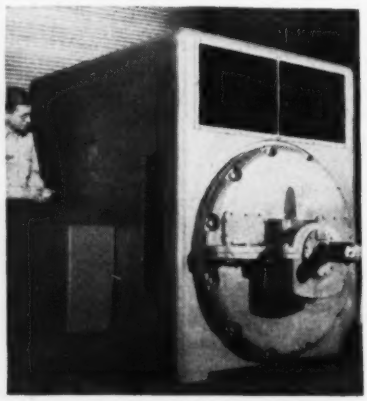


STOCK SIZES
50 VA to 15,000 VA
460/230 V. Pri. —230/115 V. Sec.
575 V. Pri.—230/ 115 V. Sec.
Special voltages on request.

JEFFERSON ELECTRIC

Jefferson POWER CIRCUIT Transformers

and wire-wound resistors; Q of inductances; turns ratio of transformers; quality of circuit capacitors.
Clough-Brengle Co, Chicago 40, Ill.

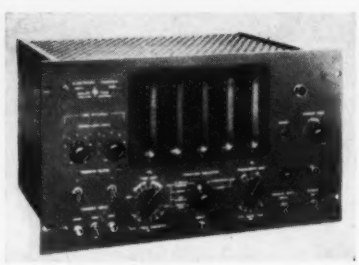


Pump Motor

Available in ratings of 1,000 hp and larger, the boiler feed-pump motor features an improved ventilation system, cubical design, a special high-speed rotor and quiet operation.

The ventilation system draws air from the motor's sides and expells it at a higher level from the shaft end of the motor over the couplings and feed pump. Ventilation in this manner is said to aid employee comfort and permit adjacent units to be mounted closer together. Savings in floor space are realized by the closer spacing.

Designed to operate at 3,600 rpm, the motor receives a special finish after grinding that aids in reducing turbulence and noise. Quiet operation is further achieved by a large air discharge chamber and the baffling affect of louvered inlets and outlets.
General Electric Co, Schenectady 5, N. Y.



Electronic Counter

Designated model 522B, measures rate of occurrences from 0.00001 to 100,000 per sec. It measures time
(*Continued on page* 178)

NEW Booklet on Measurement for DISTRIBUTION ENGINEERS

Distribution engineers are daily faced with the complex problem of how to utilize fully the capacity of their present equipment to meet today's ever increasing loads.

The solution of this problem requires specific knowledge of the factors involved. Periodic surveys are costly and do not provide the complete, *continuous* information which can be obtained only by measurement.

Sangamo's new booklet "Solving Distribution System Problems Through Measurement" tells how a number of utilities have solved this problem with permanent installations of Sangamo Thermal Meters for continuous measurement. It tells what types of instruments to use to measure ampere loading in the substation and on the distribution system . . . how KW and KVAR measurements help attain efficient system operation . . . how voltage data may be obtained economically to maintain adequate service.

Here is the answer to your load growth problems. Just clip the coupon for your copy of "Solving Distribution System Problems Through Measurement." No obligation.

SANGAMO

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

SANGAMO ELECTRIC COMPANY, SPRINGFIELD, ILLINOIS

Send my copy of "Solving Distribution System Problems Through Measurement"

YOUR NAME _____

TITLE _____

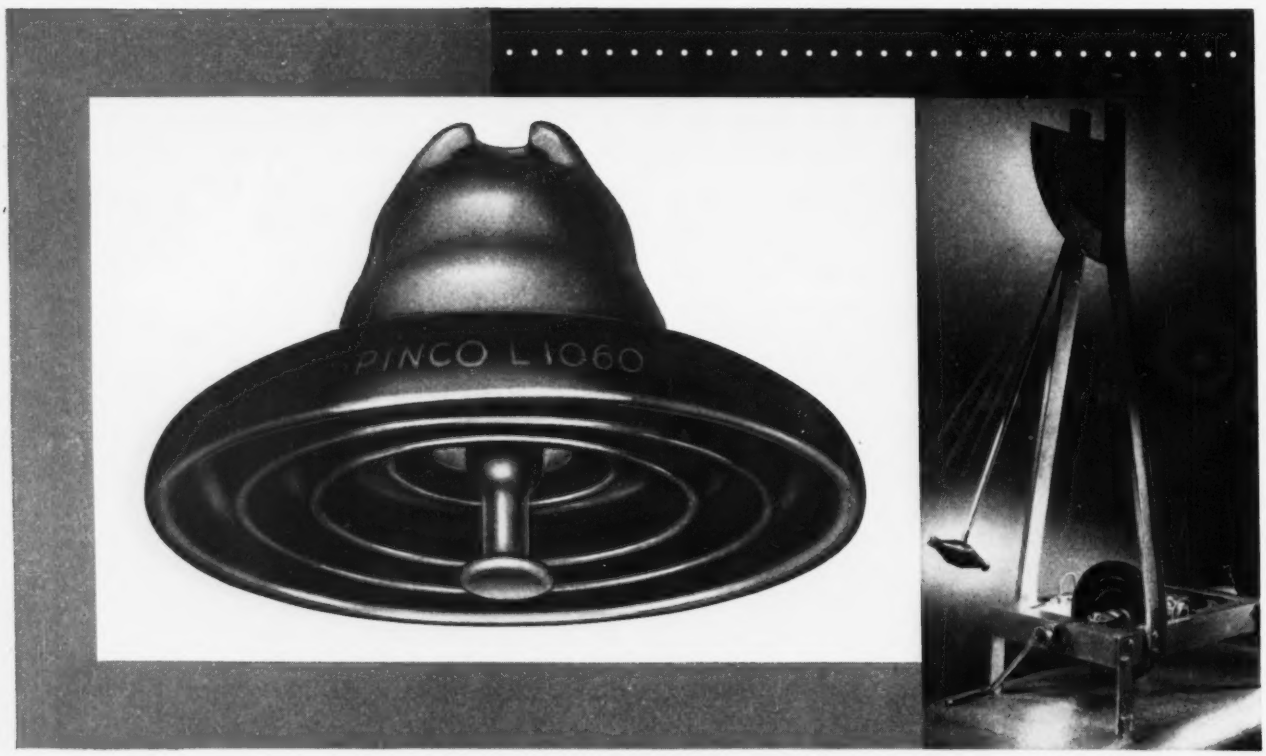
COMPANY _____

CITY and ZONE _____ STATE _____

SM53-4

a Transmission Engineer Asks—

"How do Pinco 1060 suspension units stand up under impact blows encountered in installation and service?"



Pinco Insulators of every type are continually subjected to tough laboratory tests approximating all possible conditions encountered in actual service. Typical of these is this routine test for impact strength which is made on random samples from production. Another example of Pinco's careful watchfulness over every detail, from design to completed product.

The Porcelain Insulator Corporation LIMA, N.Y.

Sales Agents: JOSLYN MFG. AND SUPPLY CO. *Offices in Principal Cities*

Suspension Insulators . . . Clamps and Fittings . . . Switch and Bus Insulators . . . Distribution and High Voltage Pin Types . . . Guy and Tree Insulators . . . Special Porcelain.

NO. 11 IN A SERIES

·····here's our Answer:

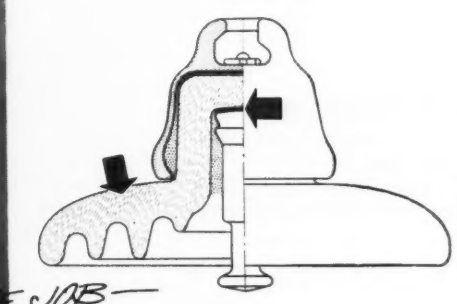
The ability of Pinco Suspension Insulators to withstand severe impact blows is attributed to the *rugged design of the porcelain body*, wherein the proper distribution of porcelain at critical points plus beaded edges produce a huskier section of sufficient strength to provide *extra* protection from impact blows encountered in installation or service. Additional protection is also provided through the use of a resilient pad between the porcelain and the top end of the pin. The cushioning action of this pad protects the porcelain from damage by impact on the end of the pin and relieves any stress which might occur.

It is features like these and many others which contribute to the over-all efficiency of Pinco Suspension Insulators . . . and offer conclusive proof that Pinco 1060 Suspension Units are designed and built for rugged "*Right on the Job*" service.

For complete electrical and mechanical specifications covering the Pinco 1060 Suspension Insulator, refer to page 65, Pinco Catalog No. 49. If you don't have a copy—write us.

PINCO
INSULATORS

RIGHT ON THE JOB—



This sectional view of a Pinco 1060 Suspension Insulator shows its rugged design characteristics and husky porcelain section. Note location of resilient "shock absorbing" pad between pin and porcelain . . . another protective feature built into every Pinco Suspension Unit.

high efficiency AEROTEC

DUST COLLECTORS

Partially erected collector showing inlet, outlet and dust discharge passages.

New Niagara Mohawk Power Corporation Dunkirk Steam Station, equipped with Aerotec Dust Collectors.

assure your plant the same protection given the *new*

NIAGARA MOHAWK POWER CORPORATION

Dunkirk Station . . . and a duplicate Albany Plant

At the new Dunkirk Steam Station of Niagara Mohawk Power Corporation, two reheat steam generators of 670,000 lb. per hour capacity are pulverized fuel-fired. Dust collection for this station is handled by Aerotec, Design 3 RAS Collectors, and a duplicate system is under construction for the new Albany Steam Plant . . . making a total of eleven Niagara Mohawk boilers to be equipped with Aerotec Dust Collectors.

The collectors for Dunkirk and Albany consist of 84 "Unit Building Block" elements completely assembled at the factory for easy erection in the field. The small diameter tubes, of permanent molded aluminum construction, have proved their extremely high collection efficiency and long life on hundreds of installations. Their light weight cuts steel requirements for supporting structure, and makes possible roof installations with a minimum of reinforcement. The light weight tubes also reduce erection costs.

Aerotec efficiencies meet or exceed the requirements of most dust ordinances today. Evenly spaced tube outlets provide excellent inlet flow conditions for an AEROTEC electrical secondary—should future ordinances require still higher efficiencies.

Write for the new Design 3 RAS Catalog No. 601.

Project and Sales Engineers

THE THERMIX CORPORATION

GREENWICH, CONNECTICUT

(*Offices in 38 Principal Cities*)

Canadian Affiliates: T. C. CHOWN, LTD.
1440 St. Catherine St., W., Montreal 25, Quebec • 50 Abell St., Toronto 3, Ontario

THE AEROTEC CORPORATION

GREENWICH, CONNECTICUT

Manufacturers of mechanical dust collectors, electrical precipitators, air cleaners, industrial integral dust collectors, gas-oil scrubbers and dust reclaiming equipment.

New Equipment

(*Continued from page* 174)

from 10 microseconds to 27.8 hr. Counting is available over periods of 1/1,000, 1/100, 1/10, 1 and 10 sec or multiples. Time of display can be varied to any duration, counts are automatically reset and action is repetitive, it is claimed.

The unit may be used to measure or count production quantities, power line frequencies, weight, etc.

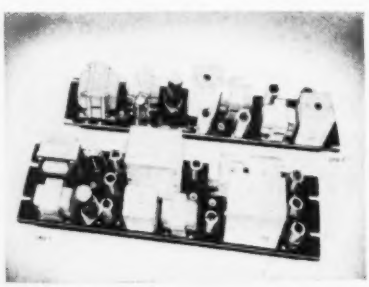
Hewlett-Packard Co, Palo Alto, Calif.

Insulated Terminals

Available in sizes 8 to 4/0, called Sta-Kon, terminal barrels are enclosed in a molded Nylon jacket to provide insulation. Jackets have a funnel-shaped interior to guide cable strands into the terminal. Annular key molded into jacket's interior is designed to hold it permanently in place.

The insulation is said to withstand 6,000 v without puncturing.

The Thomas & Betts Co, Elizabeth, N. J.



Radio Equipment

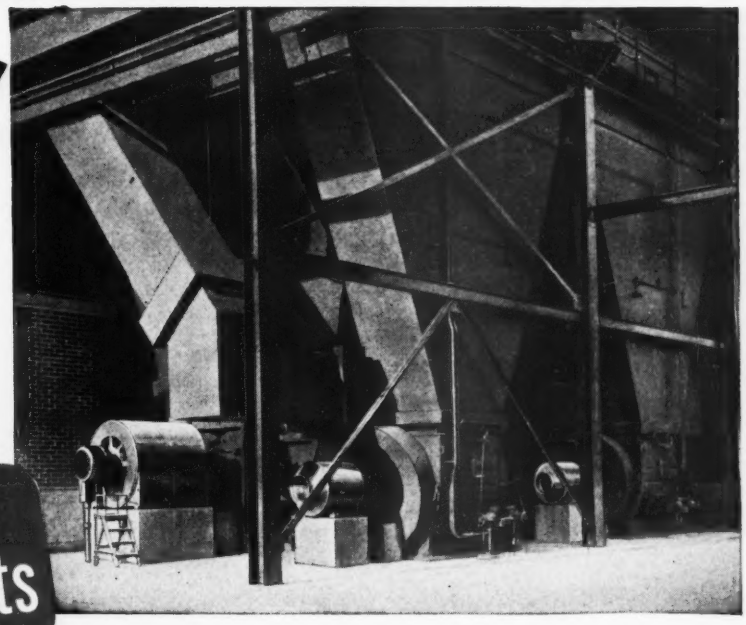
To provide design flexibility for signaling, dialing, slow speed telemetering, or supervisory control. The DTU-1 incorporates a pair of transmitters designed to bridge across a 600-ohm circuit; a total of 36 fre-

(*Continued on page* 181)

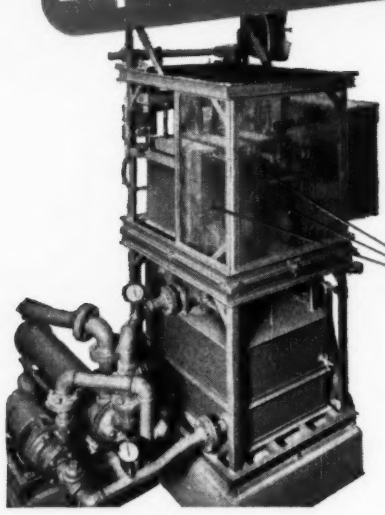
STEPLESS SPEED CONTROL

Engineered

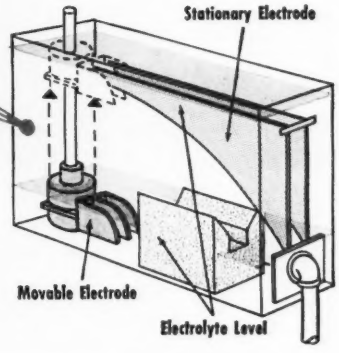
for boiler draft fans

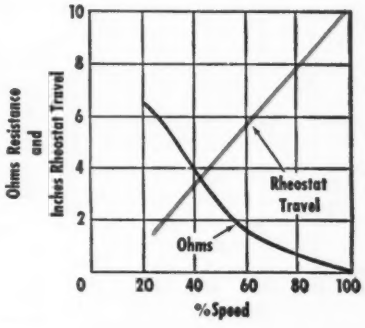


ALLIS-CHALMERS
Liquid Rheostats



FOR PROPER DRAFT CONTROL of boilers, Allis-Chalmers Liquid Rheostats are used in the secondary circuits of four 600 horsepower wound-rotor motors driving induced draft fans at the Edge Moor Station of the Delaware Power & Light Company. Direct coupling of fans and drive motors simplifies bearing alignment and maintenance problems.





TYPE 257 LIQUID RHEOSTATS can be placed in any convenient spot because only electrical connections are required. In this case, they are on the lowest floor of the power plant; the tube type TEFC drive motors are outdoors.

RHEOSTAT CELLS have both a movable electrode and a variable electrolyte level. The movable electrode is always completely immersed. Hot spots are eliminated by directing the flow of cooled electrolyte through the electrode plates.

STRAIGHT LINE SPEED CHARACTERISTICS are designed into these rheostats for each application. Needed resistance characteristics are built in by shaping the stationary electrode, and by fixing distance between electrodes.

ALLIS-CHALMERS

Allis-Chalmers Liquid Rheostats have but few moving parts . . . no arcing contacts. Electrodes can be actuated by electric, pneumatic, or hydraulic operators. Call your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin for leaflet 14S7544.

A-3721

DOW

GOING UP EVERY DAY... PENTA TREATED SOUTHERN PINE POLES

Clean, modern wood preservative controls decay and termites, cuts repair costs and gives long life to all wood poles

The Dow Chemical Company
Dept. PE 3-2B4, Midland, Michigan.

☐ Please send me free booklet, "Pointers on PENTA."
☐ Send me list of PENTA treating plants.

I am interested in PENTA for_____

Name_____

Title_____

Company_____

Address_____

City_____ State_____

Southern Pine utility poles, pressure-treated with *clean* PENTA*, are giving top performance in many sections of the country. Year after year, under all weather conditions, in all types of soil, PENTA keeps these pine poles well protected against decay and termites.

You can count on low repair and replacement costs when you specify PENTA protection. Just as important, PENTA provides that necessary "extra"—*cleanliness*, important for settings in residential areas.

Specify *clean* PENTA for all your wood construction. Over 60 pole suppliers now treat with PENTA. Ask your regular supplier to give you a quotation on PENTA-treated poles and crossarms. THE DOW CHEMICAL COMPANY, Midland, Michigan.

*PENTAchlorophenol.

you can depend on DOW CHEMICALS DOW

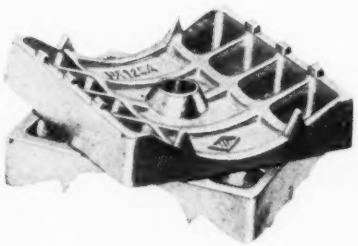
New Equipment

(*Continued from page* 177)

quency channels are available between 2,000 and 6,475 cycles.

The DRT-1 incorporates a pair of receivers mounted on a 5¼-in. standard relay rack panel. Both transmitters and receivers have their own power supplies.

Either a continuous or a keyed tone may be used. All signals can be transmitted over wire lines, telephone or power line carrier, and radio or microwave communications circuits. **Hammarlund Manufacturing Co, Inc, New York 1, N. Y.**



Gains

Called M.I.F. Grid Gains, they are said to increase the bearing value of through bolts and shear value of connections. Good performance characteristics of gains result from combined action of cone, spurs and ribs.

Gains are available for different pole sizes, various load requirements and bolt diameters. Those pictured can be mounted back to back or singly. Other styles available include: double grid gain, gain with side eyes, and gain angle connector. Accessory connecting hardware is also available. **Malleable Iron Fittings Co, Branford, Conn.**

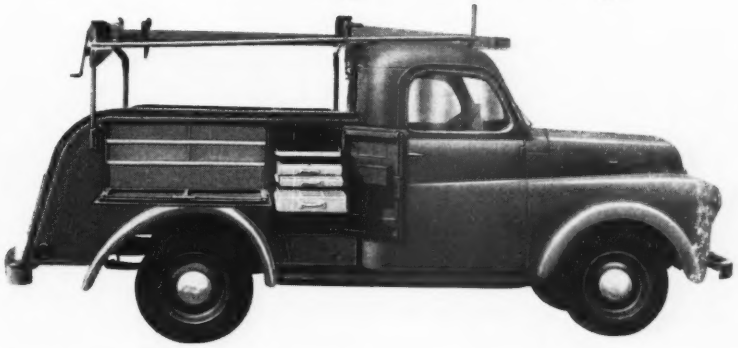
Germanium Diode

Consists of an inner housing of low loss phenolic material over which a housing of glass is assembled. The double housing construction renders superior moisture resistant characteristics as well as affording better elec-

YOU get all THREE with

YORK-HOOVER UTILITY BODIES

Quality, Performance, and Cost-Saving Efficiency



QUALITY . . . because part-by-part, York-Hoover Utility Bodies are fabricated from top quality materials by expert craftsmen. This means that when you buy York-Hoover Bodies you not only get a quality product at a fair price but a product that gives top performance besides.

PERFORMANCE . . . because each York-Hoover Body is specifically engineered for the job to be done. This, together with the factors of stability, minimum weight, ease of maintenance, and the ability to "take it" in everyday service, makes York-Hoover Utility Bodies the best buy for you.

COST-SAVING EFFICIENCY . . . is the end result . . . the reason why for over 60 years customers from coast to coast have relied on York-Hoover Equipment to give them top performance, low operating and maintenance costs. Enjoy all 3 in '53. Buy York-Hoover Utility Bodies!

York-Hoover Corporation

YORK, PENNSYLVANIA

Body Division

VOLTAGE UP
COST DOWN
Artie One-step
WITH
RTE
(artie)
ONE-STEP
RT&E Co.'s
VOLTAGE
REGULATOR
GET
LOW COST
REGULATION
Extend the load life of your distribution lines to their fullest before you spend large sums of money on reconductoring, rephasing, and adding substations.
R T & E's "Artie" One-Step Regulator is the quickest, easiest, and most economical way yet devised to correct voltage drop and increase the load life of your lines.
In less than 24 hours you can engineer line requirements, locate regulator position, and install "Artie" One-Step Regulators in service.
Be smart—do it the R T & E way.
For complete details on operation, construction, and installation, write for booklet "OSR-1."
632 N. 8TH ST.
MILWAUKEE 3,
WISCONSIN
RT&E Co.
BRANCH PLANT:
WAUKESHA,
WISCONSIN

trical isolation from adjacent circuitry.

Retention of the original wisker to crystal adjustment is maintained by welded anchors pins. All types are available for immediate shipment.
International Rectifier Corp, El Segundo, Calif.

CO_2 Extinguishers

Known as Fyre-Freez, feature squeeze valves and are available in five sizes—2½, 5, 10, 15, and 20 lb. They have been approved by Underwriter's Laboratories and the Factory Mutual Laboratory for use on Class B (flammable liquids) and Class C (electrical equipment) fires.
Walter Kidde & Co, Inc, New York 16, N. Y.

Two-Speed Chart Drive

It is designed for use with single-record strip chart instruments and will automatically increase chart speed when variable exceed a predetermined value. When normal conditions return, the chart speed drops to normal.

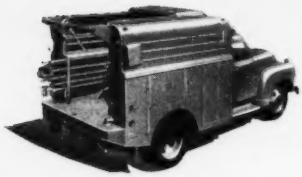
A planetary gear train, with all gears meshed and rotating, provides the quick change action for speeds of 30 to 60 times normal. Also incorporated is a manual switch to change the chart speed when required.
Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa.

Pyrometer Controllers

Of the free-vane electronic type, the controllers actuate relays, electric contactors, solenoid valves and motor

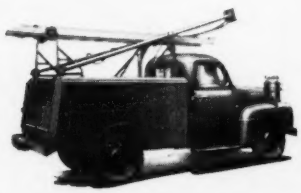
(*Continued on page* 186)

UTILITY WORKHORSE-



LINE CONSTRUCTION BODY (500)
Medium and heavy duty work. Vertical compartments are optional . . . can be equipped to fit individual needs.

REVOLVING AERIAL LADDER
Models available in working heights of 23' 6", 26' 6", 30' 6", and 32' 6" for all styles of bodies.



LIGHT DUTY MAINTENANCE BODY (350)
Fold-over type derrick will handle poles up to 40' in length. 24' ladder extends from rear of body.

HYDRAULIC TOWER
Available in sizes from 21' to 30'. Platform revolves full 360°. Tower can be operated from cab or platform.

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

FOR LONG LIFE AND TROUBLE FREE SERVICE

All *Powers-American* bodies have *earned* the reputation of "workhorse" of the utility industry by years of faithful performance. No matter how tough the job or the operating conditions, they pull more than their share of the load by stepping up crew efficiency and lowering operating costs. Whatever your utility body needs, *Powers-American* is your *1* source for *all types* of utility bodies and equipment. Write today for more information. Put a *Powers-American* "workhorse" on your job and watch the team pull ahead!

"The Accepted Standard with Utilities Everywhere"

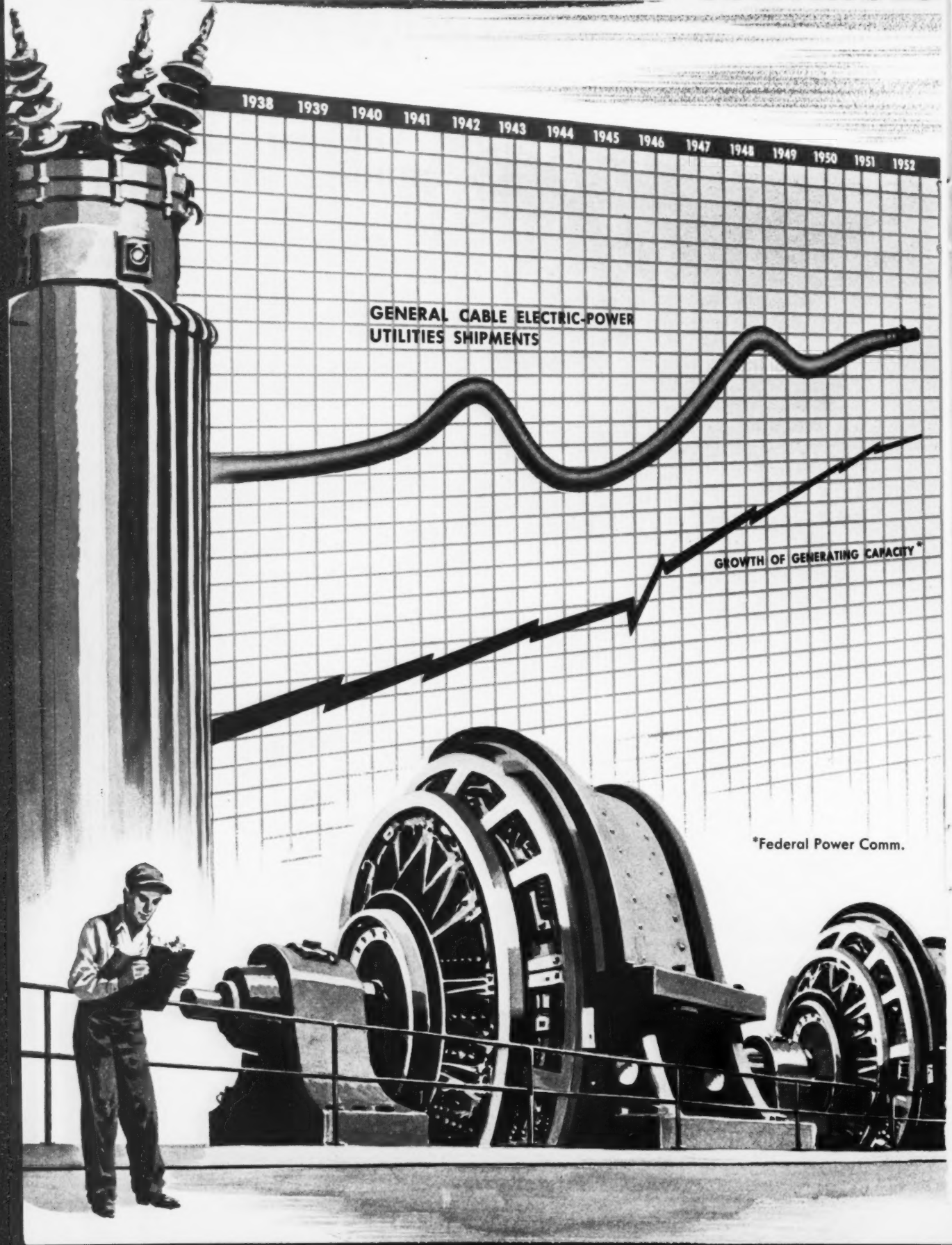
LINE CONSTRUCTION BODY (600)
Completely equipped to carry all tools and materials needed for line work. Can be furnished with winch and derrick, compressor, digger, or any special equipment required . . . for use in any phase of the utility industry. Available in 9' to 14' lengths, with or without built-in crew compartment.

POWERS *American* DIVISION
ACB

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE-POWERS AUTO BODY COMPANY
5901 North Broadway, Saint Louis 15, Missouri

AS GENERATING CAPACITY CONTINUES



TO EXPAND . . .

GENERAL CABLE

Continues to Grow ...and Serve

General Cable, like the utility industry itself, is geared to forecast trends and growth possibilities so that it may always be counted on as a dependable, progressive source of supply. Offering thousands of different wire and cable products of one standard of quality, General Cable's strategically located plants, warehouses and sales offices insure adequate supplies with swift service for every part of the country. We always have and will maintain this policy as power output demands.

For sure, dependable supply, call General Cable!

"More Power to You"®

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICE: 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

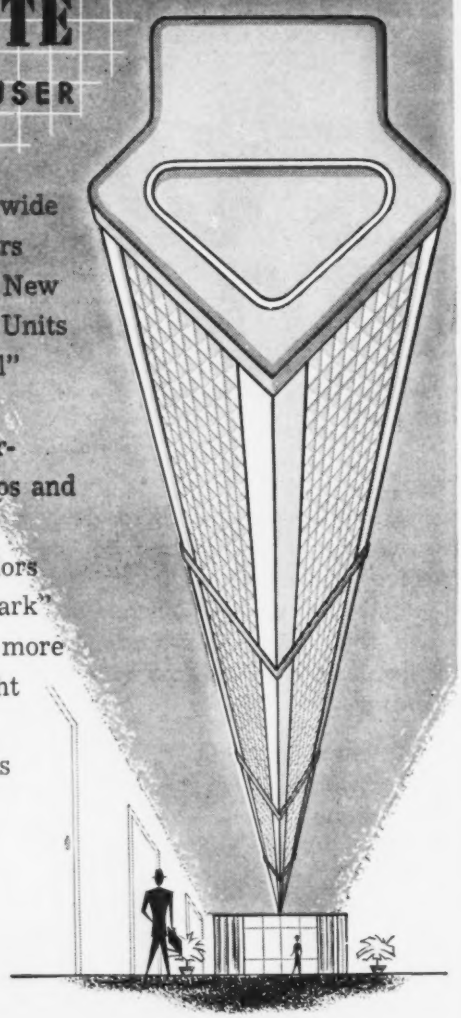
make hallways say, "Come in!"

new Guth V·C·U

"V" CORRIDOR UNIT

with GRATELITE* LOUVER-DIFFUSER

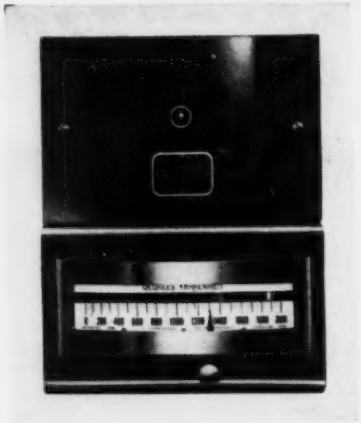
At last—you can fill wide hallways and corridors with practical light! New Guth "V" Corridor Units provide "wall-to-wall" illumination. The GRATELITE Louver-Diffuser shields lamps and is easily maintained. Hallways and corridors "come out of the dark" and turn into safer, more cheerful lines of light that guide the eyes and the step. V·C·U's available in 4′ & 8′, 1 & 2 light models.



*Patents Pending
Trademark Registered

Write for complete information today.

Guth THE EDWIN F. GUTH CO. ST. LOUIS 3, MO.



valves to provide temperature control. It features an electronic control system based on FM, a millivoltmeter mechanism and unit plug-in construction.

The basic model can be used for low-open, high-open and low-high control. And additional plug-in unit makes possible proportional current input to provide practically straight-line control. All models are available with thermocouple failsafe protection. Temperature range selections are from 0 to 400F to 0 to 3,000F.
The Bristol Co, Waterbury 20, Conn.

MORE NEW PRODUCTS
about which you should know

McGill Manufacturing Co, Inc, Valparaiso, Ind., announces a **combination switch and two lamp sockets,** made of molded phenolic, for use in table and floor lamps . . . Natvar Corp, Woodbridge, N. J., has a **plastic film,** produced from polysturene that does not exhibit brittle characteristics.

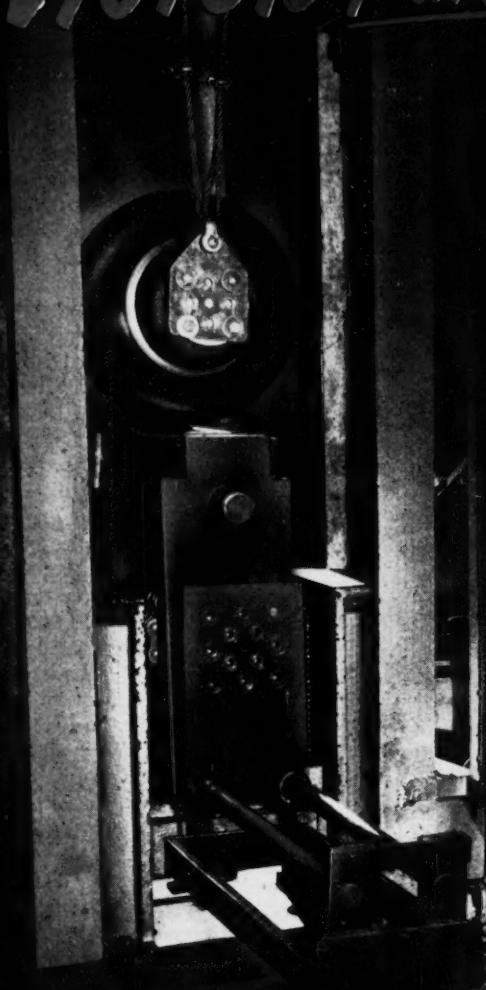
Federated Metals Division, American Smelting & Refining Co, New York, N. Y., has a **rosin core solder** known as RTS 200 . . . Pennsylvania Salt Manufacturing Co, Philadelphia 7, Pa., announces an **anti-corrosion coating** using neoprene coatings for concrete surfaces or another type neoprene coating for all other surfaces.

Lumenite Electronic Co, Chicago, Ill., announces a **time switch** that is claimed to feature a simplified tripping and switching system . . . The H. R. Kirkland Co, Morristown, N. J., has an **annunciator,** having a green and red light, and connections for trouble contacts, audible signal and to power.

YOUR SWITCH and BUS INSULATORS WILL NEVER HAVE TO TAKE THIS PUNISHMENT

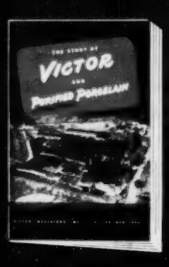
. . . but they can if they're made of

VICTOR PURIFIED PORCELAIN



Left: Victor No. 729 Stacking Unit undergoing cantilever test to determine ultimate strength.

It's pretty satisfying to know that the insulators on your system can take more punishment than they'll ever get in service. That's why more and more power men specify Victor *Purified Porcelain* insulators. Laboratory tests show they have unequalled cantilever, torsion, tension, and compression strength, perfection of glaze and durability under all service conditions. For complete engineering data, send for Bulletin No. 5.



FREE BOOKLET gives you the full story on how Victor insulators are made — how and why *Purified Porcelain* was developed. Write us for your copy.

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Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain

LETTERS TO THE EDITOR

A Reader Questions

To the Editor:

For the record I question some of the statements and figures contained in "Tomorrow's Transmission Voltages" by Mr. P. L. Bellaschi published in your Dec. 1, 1952 issue.

The author predicts extensive transmission networks at 230, 287, 300, 330, and 345 kv, as well as higher voltages. In subsequent discussion . . . the author avoids both 287 and 330. This would seem to ignore the "facts of life" in this country where a rather extensive 287-kv system has been in operation for some years and where 330-kv lines will add up to 1200 circuit-miles within three years.

The use of 300 kv as a point between 230 and 345 kv seems poorly chosen since it is not now being seriously considered for use in this country, unless on the Bonneville system. The use of 330-kv line characteristics would tend to high relative cost for 300 kv.

There can be no reason, if the lines are designed properly, for a relative capability variation other than in direct proportion to the squares of the respective voltages. The only deviation might be due to higher terminal impedances at higher voltages, but as systems are developed into networks this effect would tend to disappear. Therefore Table I should be as follows:

Voltage kv	Relative Capability Author's	Corrected
230	1.0	1.0
300	1.6	1.7
345 (single)	1.98	2.25
345 (bundle)	2.39	2.8
380 (single)	2.25	2.7
380 (bundle)	2.72	3.4

The principles for determining Basic Insulation Levels in Tables III and IV may not be too clear. The direct approach involves the following steps:

1. Determine by calculation or transient analyzer the maximum dynamic overvoltage.

2. Select the minimum voltage lightning arrester which will withstand, allowing a reasonable safety margin, the maximum dynamic overvoltage.

3. Determine the BIL for transformers and other equipment which gives a suitable safety margin above protective level afforded by the arrester.

This was the approach used in determining the 1175 BIL adopted for the AG&E 330-kv system. For other systems having different physical characteristics, a higher BIL might be required.

"Tomorrow's Transmission Voltages" can scarcely afford to ignore "today's transmission voltages." The latter include the 287-kv system now in existence, the 330-kv systems developed, constructed, or authorized, and the 380-kv system already in operation in Sweden. This selection of voltages over the range from 230 kv to 380 kv does not appear to be entirely illogical.

Nominal Rated Kv	Maximum Operating Kv
230	242
287	300
330	350
380	400

Harry P. St. Clair
System Planning Engineer
American G&E Service Corp
New York 8, New York

The Author Replies

To the Editor:

The discussion by Mr. H. P. St. Clair reduces in part to a consideration of the following:

1. "Facts of life" in regard to EHV's

2. Relative power capability vs. voltage

3. Comparative annual costs and characteristics of the 300-kv line

4. Basic Insulation Levels

The second chart (map) of the article presents the status of 230, 288, 300, 330, 345 kv and higher voltages as of November 15, 1952. The chart is based on an extensive survey and the tabulations are drawn from typical case studies. Frequent reference to 288 and 380 kv will be found. In addition, developments here and abroad are set forth in Table VI. It would seem, therefore, that the "facts of life" are reasonably well recognized.

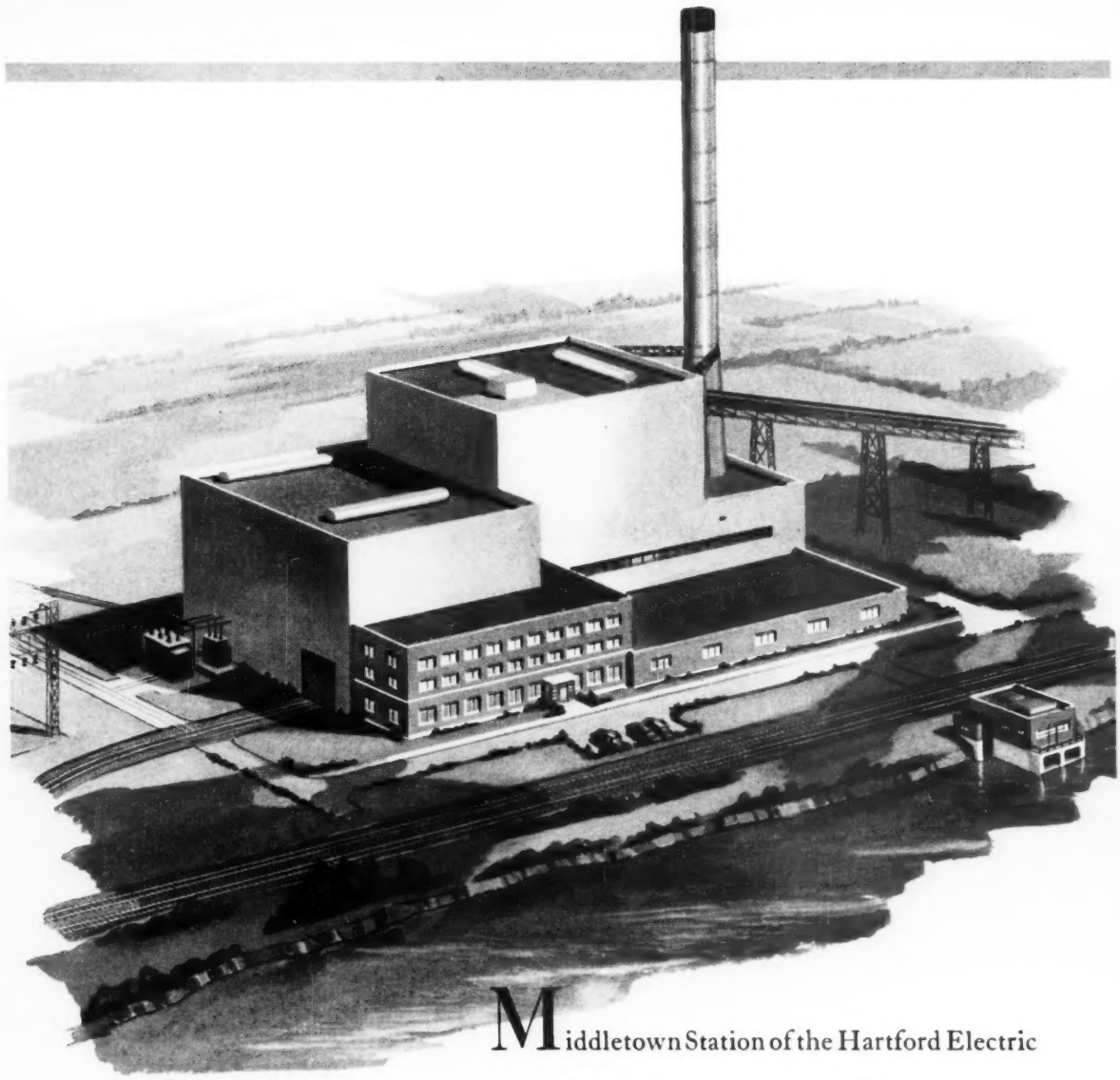
In regard to power capability, the voltage-square relation would require that system terminal impedances be reduced in proportion to the line impedances. This condition in general is not attainable or economical. The values in Table I are based on actual case studies and reflect realistic results. The importance of reducing terminal impedances to the lowest economical is discussed in Table V.

The assumption that the characteristics of the 300-kv line correspond to the 330-kv design developed by AG&E is not correct. The conductor is a solid ACSR 800 MCM copper equivalent 1.382 in. diameter, the spacing between conductors 26.3 ft and the number of insulators in suspension 16 units. The tabulation presents comparative unit transmission costs based on typical specific case studies. The choice of 288 kv instead of 300 kv would not have affected the better economy at 345 kv for bulk-power straightway transmission of 200 miles. The annual charges and cost of losses correspond to federal practices. Even a substantial variation from these should not affect the basic conclusions materially.

The principles for determining Basic Insulation Levels outlined by Mr. St. Clair are well accepted in present-day practice. These are recognized throughout the article—for example, in the statement that 75 percent BIL's can be applied provided maximum dynamic overvoltages do not exceed 110 to 115 percent line-to-ground voltage and switching overvoltages about 2½ times. However, it is essential to classify types of systems (degree of grounding) and to consider arrangement in steps if the number of BIL's is to be held to a minimum and yet serve the overall needs of industry effectively and economically.

There can be no question that 330 kv has become one of the recognized voltages, but to restrict the entire industry to this voltage alone over the entire range from 288 to 380 kv would certainly be cause for grave concern. An invaluable characteristic of engineering is the continuous progress towards more effective utilization of facilities, materials, and investment. A case in point is the 1.6-in. expanded-conductor design for 330 kv (350 kv maximum) originally considered for 300/315 kv. Likewise, there are important applications where economy dictates 345 kv rather than 330 kv.

If the future requirements are to be fulfilled most economically, the selection of new BIL's for the EHV's



Middletown Station's initial generating unit, scheduled for operation early in 1954, will add 60,000 kilowatts to Hartford Electric Light Company's capacity. The station is planned for future expansion to a total of six units.

Middletown Station of the Hartford Electric Light Company, now under construction at Middletown, Connecticut, is another major design and construction job for this client since 1920.

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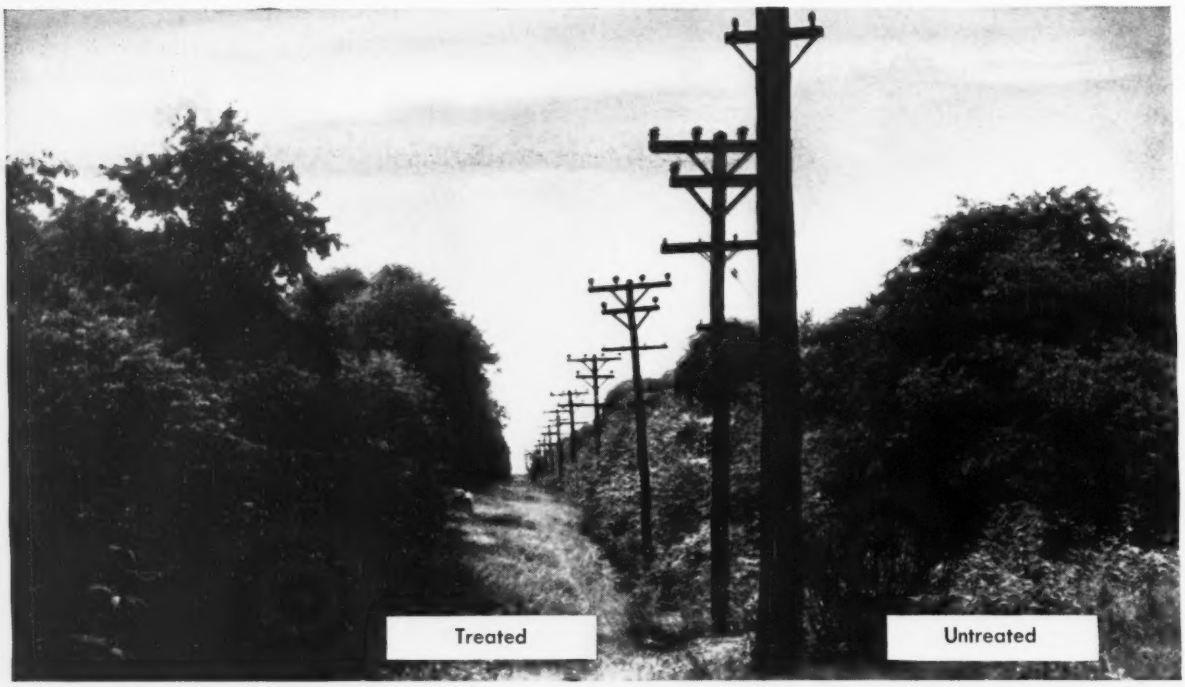

Dow's low-volatility ester brush killers supply the answers to your vegetation control problems on right-of-ways, around substations, pole yards, booster stations, and along fences. Esteron® Brush Killer and Esteron 245 enable your field crews to get their assignments done quickly at savings from 25% to as high as 50% over handcutting methods.

Esteron Brush Killer, a mixture of propylene glycol butyl ether esters of 2,4-D and 2,4,5-T, controls most woody species as a foliage spray. Esteron 245 contains the propylene glycol butyl ether esters of 2,4,5-T for control of certain resistant species. It can be used as a water spray on foliage or in oil for year-around basal bark application. Both products are useful for stump treatment in any season, making manual cutting really effective as a brush control measure.

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must provide a fundamentally sound basis and a flexible structure. The following values appear basic: 1200 or 1175, 1300, 1400 and possibly 1550. A tabulation covering future transmission voltages would include 288 and 300 kv, 330 and 345 kv in addition to possibly 400 kv or even a higher voltage. Corresponding maximum values provide the usual allowance above nominal.

P. L. Bellaschi
Consulting Engineer
Portland, Oregon

Woodpeckers Again

To the Editor:

We were quite interested in the article by Mr. W. L. Rush on "Steel Mesh Solves Woodpecker Problem" which appeared in your issue of February 9.

We have received a number of requests for information on how to solve the woodpecker problem and we believe that the article by Mr. Rush is an excellent reply to this question.

We would like to mimeograph the article for distribution, if you do not have any objection.

W. W Hanly, jr
Sales Manager
Wood-Treating Chemicals Co
St. Louis, Mo.

• Let it not be said we did less than our utmost to aid in the thwarting of woodpeckers.

Short Circuit Calculation

To the Editor:

I find particularly useful much of the information contained in your Engineering Reference Sheets. Sheet No. 52-25 in the November 17, 1952 issue concerned calculation of short-circuit currents in industrial plants, a problem that has received much attention over the past 10 years but which still needs to be impressed upon the minds of engineers.

There is, however, one discrepancy in that the sheet does not concur with present industry standards. The author neglected to include the short-circuit contribution from the motors. All industrial systems have a large percentage of motors connected to them. These motors, whether they are induction or synchronous, will produce a short-circuit current nearly equal to their locked rotor current. This motor

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Digs holes 9" to 20" in diameter, 7' to 10' deep.

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Illustration shows Highway HD Boring Machine in operation. From position on truck platform operator is assured complete visibility Simple dual-levers give complete control at all times.

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● It is no problem to get dry, complaint-free pressure-creosoted wood poles. It takes creosote of proper specification for residue and proper pressure treatment. Your treater knows. He can treat wood with creosote so that it stays dry; and he is doing it every day. This is part of his constant effort to turn out an increasingly better and better product.

And remember . . . creosote is the *only* preservative that has kept wood sound and serviceable under severe conditions for more than 30 years.

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contribution is considerable. For example, a 100-kva, 5½% impedance transformer contributes 26,400 amp short circuit current and the motors about 6,000 amp, making a total of 32,400 amp. The motor accounts for almost 20% of the total.

For further reference on this subject, I refer you to the AIEE Transactions, Volume 60, 1941, September, pages 877-881, titled "The Power Circuit Breaker Interrupting Problem." This article contains the statement: "In industrial applications synchronous motor contributions may be of the same order of magnitude as that from generators and hence must be taken into account."

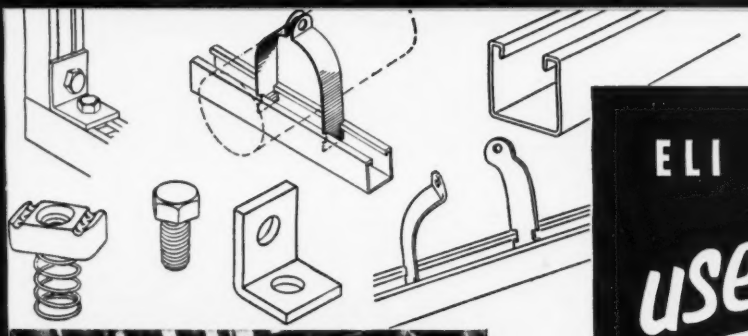
I believe the author probably was thinking of Central Station applications as this same AIEE reference has this statement: "For most Central Station applications the additional contribution from synchronous motors will be negligible but where there is an appreciable contribution from them they should be taken into account."

D. L. Beeman, Manager
Industrial Power Engineering
General Electric Co
Schenectady, N. Y.

• In reply Author Frank Reeves says: "The material in Engineering Reference Sheet 52-25 was not intended as a guide to the making of short circuit calculations, but rather for the purpose of offering some helpful hints on how to reduce the work involved.

"It is presumed that those using this reference sheet have a working knowledge of all the factors involved. It would be, of course, impossible to include complete instructions on how to make short circuit calculations on one page. There is a wealth of material on this subject, and it will be found that the article augments such material by combining most of the useful formulae with many time-saving short cuts, all on one page.

"In regard to the contribution of motors to short circuits, synchronous motors and synchronous condensers must be considered as generators for this purpose, and induction motors under the conditions which will be outlined in the article "Motor Reactance for Duty Calculation of 600-v Circuit Breakers and Fuses" which will appear in an early issue. This article contains a table in which reactances for all sizes of motors are given in order to further simplify short circuit calculations."



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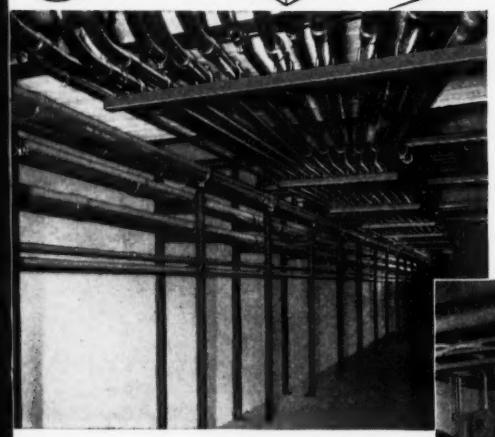
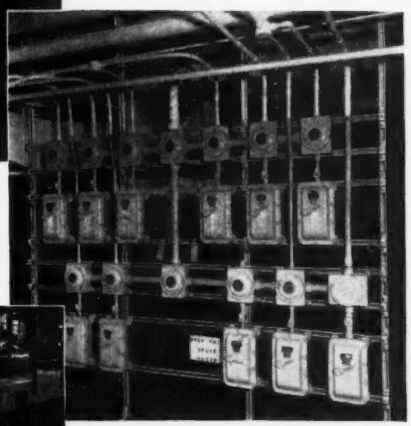
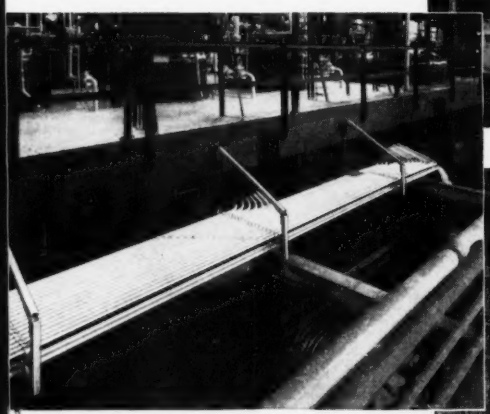


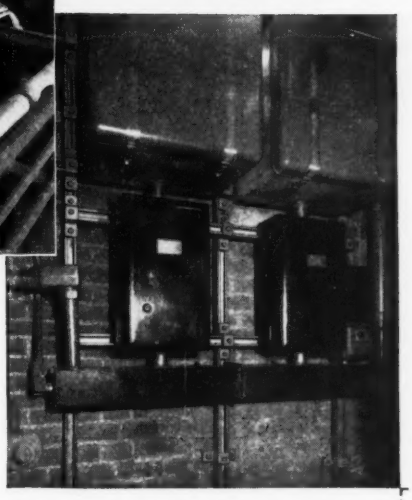
Stanchions and trapeze supports of UNISTRUT carry high voltage and metering conduits in a Lilly tunnel installation.



Load Center in Glandular Products section. Note how flexible UNISTRUT permits gear to be installed in exact location desired.



Here UNISTRUT carries heavy banks of conduit leading to motors in the penicillin fermentation area.



First UNISTRUT installation made at Eli Lilly, in 1942, supports motor controls for pumping equipment.

in countless plant maintenance jobs!

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Lilly uses UNISTRUT to

- ★ **Rack Conduit, Cable and Mechanical Piping**
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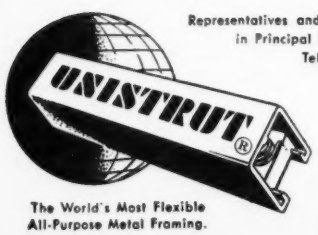
LILLY maintenance men find completely adjustable UNISTRUT all-purpose metal framing easy to handle and quick to erect, providing great strength without bulk. Adjustments, changes, and additions are easily made at any time.

UNISTRUT cuts costs, too. You save time in engineering detailing and eliminate the need for trained erection crews—anyone can build with UNISTRUT. No drilling, no welding, no special tools or equipment—all you need is a hacksaw and a wrench. It will pay you to stock UNISTRUT as a maintenance material.



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For best results, use the anchor that pushes *eight* blades into undisturbed earth all around the hole, with no wasted space between blades. This means complete, balanced load distribution.

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the CHANCE 8-WAY *gives full load distribution*

Anchor installations are *faster, easier* and *better* when line crews use the right tools. Chance tools are designed for efficiency and safety. The tools shown at right are what you need for expanding anchor installations.

1. Chance Combination Expanding and Tamping Bar. It hooks around the anchor rod and will not slip off.
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Send for the Chance folder on the tools to use for better anchor installations.

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NUMBER ONE OF A SERIES

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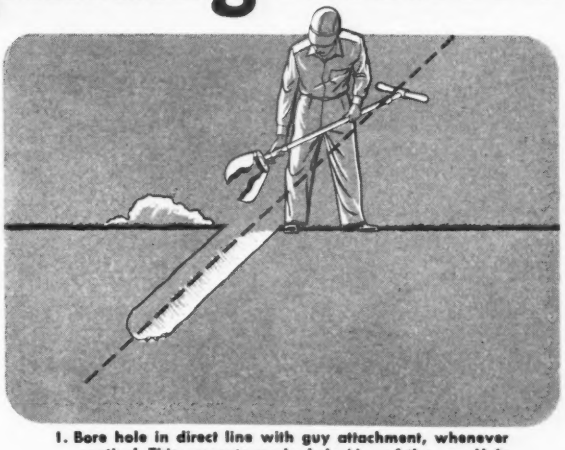
How to install Expanding Anchors

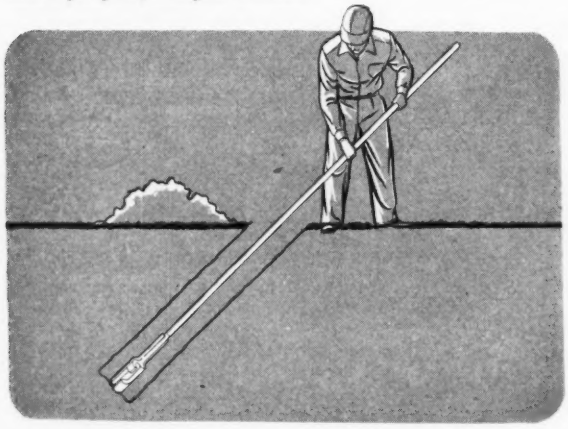
Good anchoring is cheap insurance against line disaster. Failures can be costly, and since the anchors cannot be inspected after installation, it is important that they be properly installed. Combining the best methods developed in years of field use with our 45 years of engineering development and testing experience, the A. B. Chance Company offers these suggestions for getting the most out of your anchors . . .

Expanding anchors may be used in any type of soil with the exception of hard rock, shale, extreme hardpan and, of course, swamps and marshes.

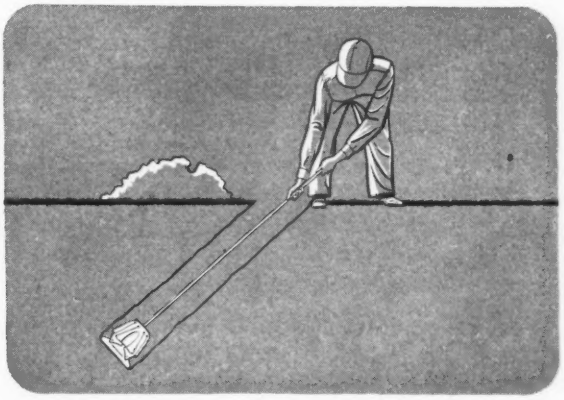
Merely dropping the anchor in the hole, throwing in the dirt, and piling it up in a little mound to allow for settling, is the easy—but ineffective way! An anchor so installed will not develop its rated holding power. The successful formula for a good expanding anchor installation is the correct sized hole at the right angle, complete expansion, and a properly tamped backfill.



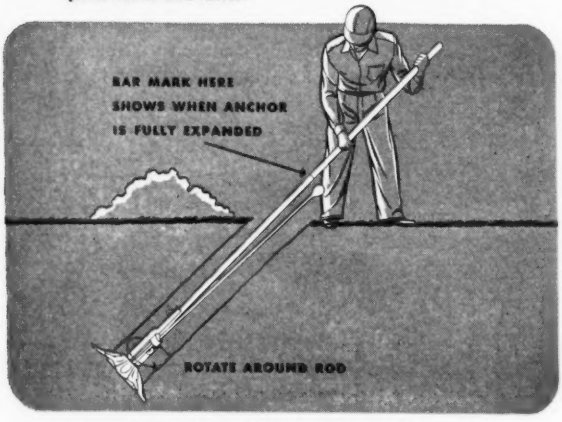
1. Bore hole in direct line with guy attachment, whenever practical. This prevents gradual slacking of the guy. Hole should be same diameter as anchor for greatest holding power.



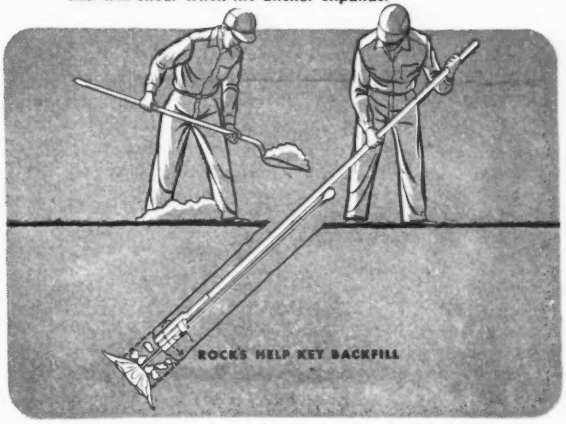
2. Tamp the bottom of the hole to square it off and give the anchor a good foundation. This helps the anchor to expand easier and faster.



3. Attach anchor to rod and push to bottom of the hole. *Do Not remove tie wires.* They help in placing the anchor and will shear when the anchor expands.



4. Expand the anchor with an expanding and tamping bar that hooks around the rod. Be sure that the anchor expands fully. A mark on the expanding bar will help.

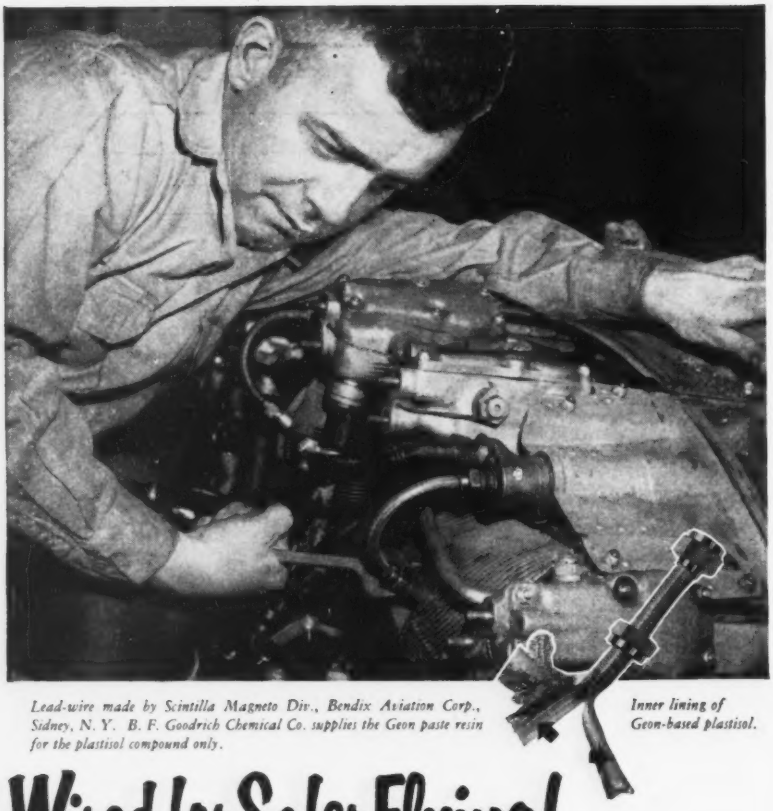


5. Tamp backfill thoroughly with expanding bar hooked around anchor rod. Rotate bar during tamping to pack entire area. Use driest dirt for first 2 feet of fill.

Reprints of this advertisement for your bulletin board, or for distribution to your men, are yours for the asking—request Form 21, Expanding Anchors. Write A. B. Chance Company, Centralia, Mo.

Another new development using

B. F. Goodrich Chemical *raw materials*



Lead-wire made by Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y. B. F. Goodrich Chemical Co. supplies the Geon paste resin for the plastisol compound only.

Inner lining of Geon-based plastisol.

Wired for Safer Flying!

Geon helps protect new lead-wire assembly

AIRCRAFT engine lead-wires for carrying high voltage from the transformer coil to spark plug were rubber covered nickel braid. They frequently deteriorated quickly from the effects of ozone and engine heat. Result—*higher* maintenance costs, *lower* safety factor.

After months of experimenting, engineers came up with the answer: a lead-wire with an inner lining of plastisol made from Geon paste resin, plus two other layers of plastisol between the nickel braid.

This lightweight, vinyl plastic impregnated lead-wire has the strong, waterproof, *ozone and heat-resistant* protection that was needed. A flexible metal tube insert for enclosing the wires is no longer required. And this Geon-helped lead-wire also resists the effects of *mineral spirit solvents* which are flushed on the engine during cleaning operations.

Plastisols made from Geon paste resin can be molded, cast, coated or dipped. They can be made resistant to oils, greases, heat and cold, abrasion and many chemicals. Perhaps Geon paste resin, or other Geon materials, can help you improve or develop more saleable products. For technical bulletins, please write Dept. GJ-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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At Industry's Meetings

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WALKER G. WHITE, general manager, Electrical contracting operations, Elevator Division, Westinghouse Electric Corp, before the Real Estate Board of New York City at New York.

The operatorless elevator in the making for a long time, is now here to stay and has opened up a new era in vertical transportation. This recently perfected operatorless elevator system should not be confused with apartment house push button elevators in use many years. The new system is capable of continuous heavy duty in large office buildings.

Each car of such an elevator system not only operates itself, but coordinates its operation with that of the other cars. Service is distributed to all floors in an efficient and uniform manner as different traffic conditions arise. Passengers simply push buttons to call a car and indicate the floor they desire. The Selectromatic-automatic system takes care of all the rest automatically.

Research Department: An Answer to Higher Costs

J. R. HODNETTE, vice president, Westinghouse Electric Corporation before the Public Utilities Buyers Group of the National Association of Purchasing Agents at New Orleans, La.

Industrial research and development may play a major role in keeping prices down by producing more efficient machinery and equipment. Research cuts installation, operation and maintenance costs and brings direct savings, which are reflected in prices.

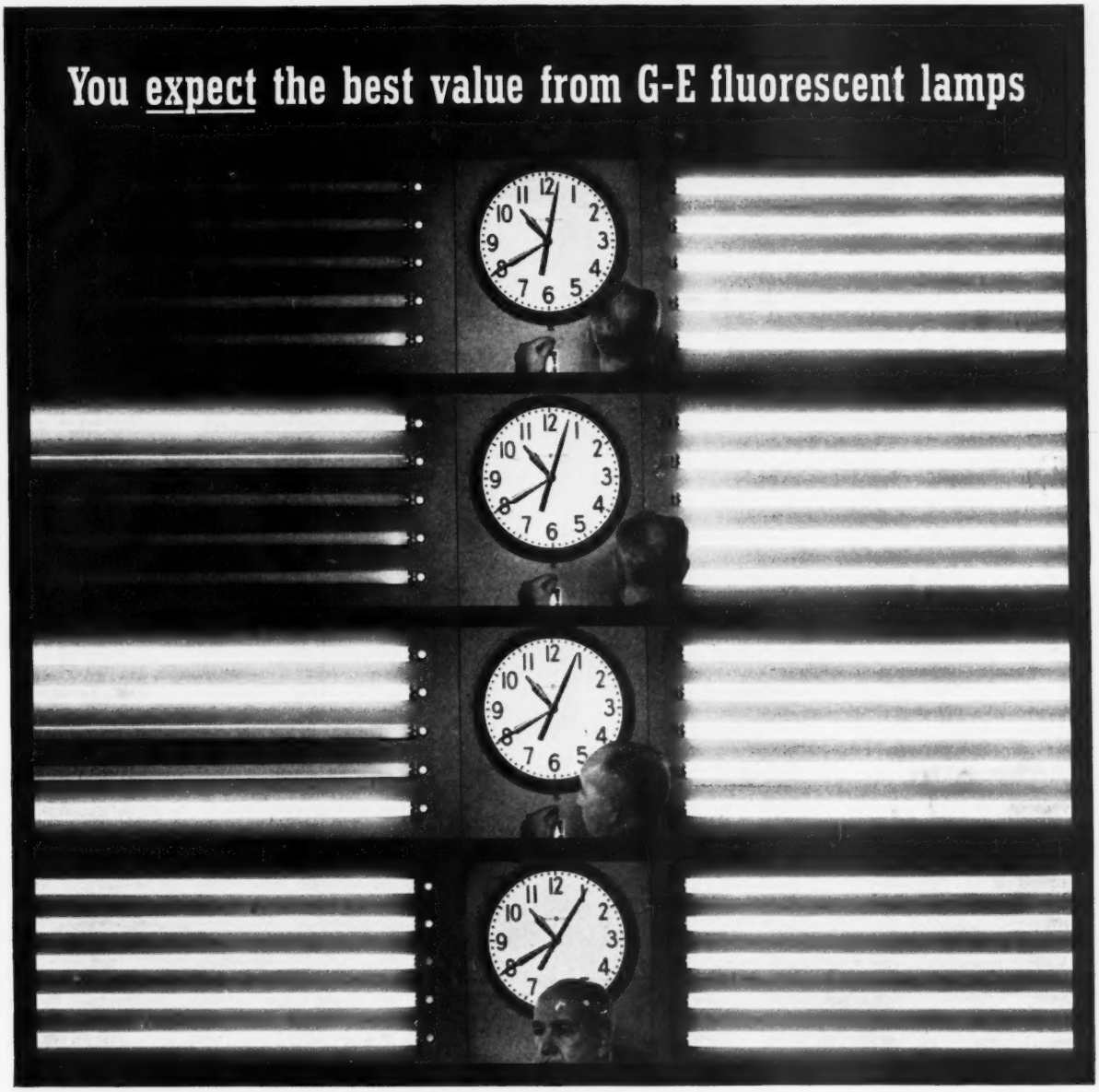
The electrical manufacturing industry offers a striking example of internal cost reduction. Programs are being aimed directly at cutting product costs and holding prices to the lowest possible level in spite of rising labor and material costs.

Atom's Place in Power

H. A. WINNE, vice president, engineering before the Elfan Society at San Francisco, Calif.

The atom certainly offers possibilities as a source of power in the long-term future in oil rich California. I do not think the time will ever come when atomic energy will replace oil or gas as

You expect the best value from G-E fluorescent lamps



Above are four unretouched photos taken about one second apart. The lamps on the left are regular fluorescent lamps. Those on the right are new General Electric *Rapid Start* fluorescent lamps. All were started at the same instant.

Within two seconds, all five G-E *Rapid Start* lamps are fully lighted. The regular lamps are only beginning to light.

The G-E *Rapid Start* lamp eliminates the starter, required to pre-heat regular lamps. Starting is almost instantaneous, maintenance is simpler, cheaper.

Two new General Electric developments made the *Rapid Start* lamp possible: a triple-coil cathode that holds more starting chemical and a *Rapid Start* ballast that pre-heats the lamp automatically.

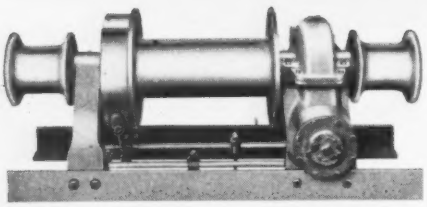
General Electric *Rapid Start* lamps and ballasts are now available. They're another reason why you can *expect* the best value from G-E fluorescent lamps. For free folder, "Facts About Rapid Start", write General Electric, Dept. 166-EW-4, Nela Park, Cleveland 12, Ohio.

New G-E fluorescent lamp starts quicker, needs no starter

You can put your confidence in —

GENERAL ELECTRIC

TULSA* WINCHES



The Model 23 Tulsa Winch is installed on the truck below. There are 27 other models in capacities from 6,500 to 80,000 lbs. for all makes and models of trucks and crawler tractors.

FOR HAULING...

Loading and unloading 3-ton cable reels is a simple task for this California trucking contractor. Working for a West Coast public utility, the driver easily, quickly and safely handles these reels of expensive copper cable. His Model 23 Tulsa Winch does the entire job.

Tulsa* Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

*Reg. U. S. Pat. Off.

a fuel. Atomic energy will only supplement more conventional fuels. It will be used in situations where its peculiar qualities solve specific problems, such as in ships and atomic electric power plants in the future.

When I speak of an atomic-electric power plant, I mean a plant in which a nuclear reactor or atomic pile generates heat due to the fission, or splitting, of atoms of uranium or plutonium. This heat then produces steam or hot gas which in turn operates a conventional steam turbine or gas turbine driven electric generator. Of course, it would be very nice if we could convert directly to electric power the energy released from the splitting atoms, but there seems to be no known or probable way of doing this. So we have to think of the atomic pile as essentially a steam generator, with practically no change in that part of the power station which is beyond the turbine throttle valve. A small experimental plant has already been built and is now in operation.

Because nuclear fuel is such an extremely concentrated source of energy, it may bring economical electrical power to areas where the transportation costs on ordinary fuel are extremely high, before it comes into more general use. However, I do not visualize small atomic power plants springing up in every isolated area. To be efficient and economical, the atomic plant will be of large capacity, perhaps at least a hundred thousand kilowatts, except perhaps in the case of military or other very special situations.

New Corporate Citizens

TOMLINSON FORT, vice president, in charge of the Westinghouse Electric Corp Apparatus Division before the 20th Annual Conference of the Southeastern Electric Exchange at Boca Raton, Florida.

One of the great industrial migrations in history has taken place in the past 25 years with the movement of industry into the South. Most of our large corporations with national distribution are operating or building one or more plants in this area.

The very survival of our manufacturer citizen in this competitive world requires a broad program of research and development. Extensive research and development are required if the corporate citizen is to give improved products and greater value.

TRADE MARK

C-O-TWO

REG. U.S. PAT. OFF.

FIRE EXTINGUISHERS

give fast, positive fire protection

● Top quality backed by experienced engineering results in operating superiority at all times with the world famous C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers as well as the newer C-O-TWO Dry Chemical Type Fire Extinguishers. Furthermore, modern manufacturing facilities and extensive field testing, together with approvals such as the Underwriters' Laboratories, Inc., Factory Mutual Laboratories and Government Bureaus assure you of fast, positive action the instant fire strikes.

CARBON DIOXIDE TYPE

With C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers the penetrating carbon dioxide is a clean, dry, non-damaging, non-conducting inert gas . . . smothers fire in seconds, leaves no after fire mess . . . highly effective on flammable liquid and electrical fires, as well as some surface fires involving ordinary combustible materials. The C-O-TWO Squeez-Grip Valve is the greatest single contribution to the releasing of carbon dioxide for first aid fire fighting . . . just squeeze lever to open . . . release to close.

Convenient 2½, 5, 10, 15 and 20 pound hand sizes . . . discharge horn non-conducting, shatterproof construction. Also, convenient 50, 75 and 100 pound wheeled sizes . . . available with sturdy, wide-faced wheels either with or without rubber tires, as well as available with or without discharge hose and horn protection cover.

DRY CHEMICAL TYPE

With C-O-TWO Dry Chemical Type Fire Extinguishers the heat-shielding dry chemical is a non-conducting, non-abrasive, non-toxic, finely pulverized powder compound . . . blankets fire instantly . . . exceedingly effective on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials. The exclusive inverting design renders constant free flowing dry chemical, assuring faster, more effective and complete discharge.

Convenient 4, 20 and 30 pound hand sizes . . . no syphon tubes or valves within the cylinder to become clogged or inoperative . . . discharge hose and squeeze type discharge nozzle remain empty until actuation takes place . . . one piece removable top assembly. Also, convenient 150 pound wheeled size . . . sturdy, wide-faced wheels . . . discharge hose and two position discharge nozzle having soft or solid stream fully enclosed in protection casing . . . footrail and dual bar handle provide easy inverting.

Act now for complete free information on these fast, positive fire extinguishers. Remember fire doesn't wait . . . get the facts today!

TRADE MARK

C-O-TWO

REG. U.S. PAT. OFF.

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY

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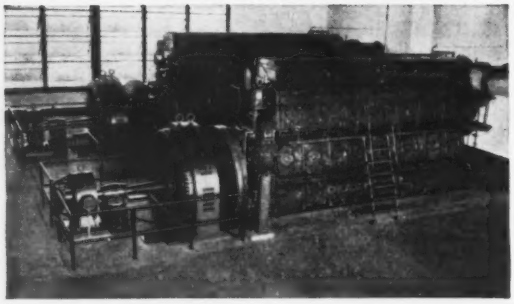
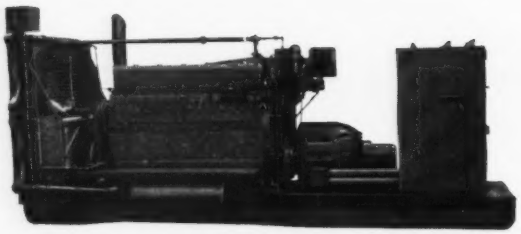
C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY



Two 1000 KW units in a Midwestern Public Utility.



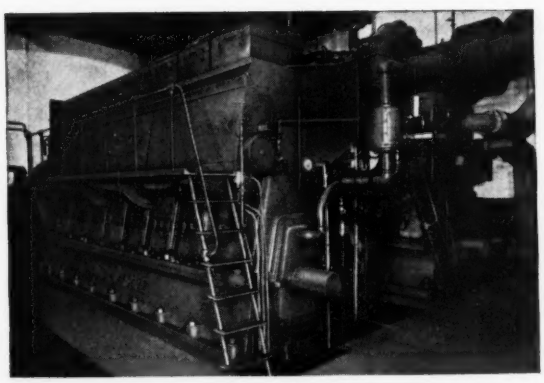
500 KW Package Unit for Utility service.

MORE POWER

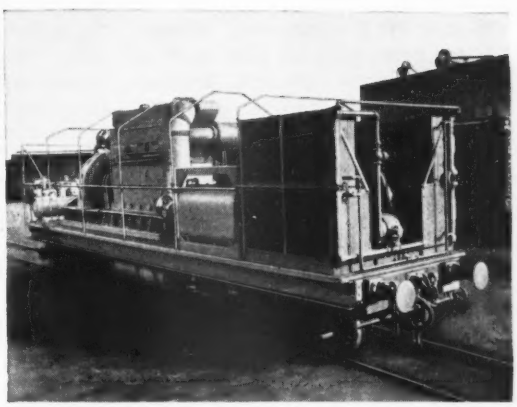
You get tops in power performance and dependability at low operating cost with CP Diesel, Dual Fuel, and Gas Engines. Efficient CP engines are available in sizes capable of delivering from 120 HP to 1750 HP and in normally aspirated or supercharged models.

Widely used for all types of service in public utilities where low cost reliable power is required, CP engines are ideally suited for emergency portable power units and for heavy duty stationary service. For more detailed information, write *Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.*

to you—at less cost



1250 KW Dual Fuel Generating Unit in an Iowa Public Utility.



500 KW Railcar Unit for mobile service in harvesting areas, and emergency service in disaster areas.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM TOOLS • AVIATION ACCESSORIES

NEWS ABOUT PEOPLE

M. NIELSEN

WILLIAM H. ROWAND

Babcock & Wilcox Elects 2 VPs

Nielsen, Rowand are advanced to post of vice president. Gay becomes head of newly established Atomic Power Division

Babcock & Wilcox Co, New York, has announced the election of two vice presidents and the establishment of an Atomic Power Division.

M. Nielsen has been elected a vice president of the company and has been placed in full charge of the manufacturing department of Babcock & Wilcox's Boiler Division. Nielsen, who joined Babcock & Wilcox in 1924, has been serving for the past year as assistant vice president, manufacturing department.

To Continue as Chief Engineer . . . William H. Rowand, chief engineer of the Boiler Division, also has been appointed a vice president. Rowand, who started with B&W in 1929, will continue to hold the post of divisional chief engineer.

Cecil H. Gay, vice president and formerly head of the manufacturing department of Babcock & Wilcox's Boiler Division, has been placed in charge of the company's newly created Atomic Power Division. Babcock & Wilcox, engaged in nuclear work since 1943, is actively associated with Detroit Edison and Dow Chemical companies in work applying atomic power to the generation of electricity.

Division General Manager . . . In another appointment, James E. Brinckerhoff, formerly sales manager of the Refractories Division, was made general manager of the division.

Other changes in the Refractories Division are as follows:

C. L. Norton, Jr, formerly technical director, will become executive assistant in charge of all development and engineering activities. Carl Claus, formerly superintendent of the Augusta works, will become executive assistant in charge of all sales manufacturing operations. Royce K. Mack, Claus' assistant, will succeed the latter as superintendent of the Augusta works.

J. D. McCullough will continue as chief engineer in charge of engineering, service and application, with additional duties. Bradford Hooper, a former assistant to Norton, will become technical director. Formerly district manager of the Pittsburgh office. Mark J. Terman will become sales manager.

•

Warren H. Edman, formerly manager of lighting sales for Line Material Co, has joined Holophane Co, Inc, New York, as manager of the street lighting department at Newark, Ohio.

Francis K. McCune has been named general manager of General Electric Co's Atomic Products Division. In his new capacity, McCune will be responsible for GE's 11,000-man atomic energy activities, which include Hanford Atomic Products Operation, Richland, Wash., and the Knolls Atomic Power Laboratory, Schenectady. Prior to assuming his most recent post of assistant manager of GE's Engineering Services Division, McCune served as assistant general manager of the Hanford Atomic Products Operation.

A. H. Gillespie has been appointed general sales manager of Amplex Corp, Brooklyn, N. Y. Long an executive in the lighting field, Gillespie previously headed lamp merchandising for the New York Merchandising Co.

F. S. Cornell has been named executive assistant to the president of A. O. Smith Corp, Milwaukee. Cornell also will continue his responsibility as manager of the Permaglas-Heating Division at Kankakee, Ill. Under Cornell's direction, the Kankakee operation will be administered by a four-man committee consisting of the following department heads: **R. S. Friend,** works manager; **W. W. Higgins,** chief engineer; **S. E. Wolkenheim,** general sales manager of the division; and **D. J. O'Connel,** business administration.

FRANK J. MOYLAN

Omaha PPD Reveals Management Changes

Frank J. Moylan, formerly assistant general manager in charge of operations for Omaha Public Power District, has been named to succeed Fay E. Smith as operating head of the utility. Moylan is a veteran of 41 years of service with the organization.

Smith, who has been general manager of the district since 1950, has

TOOL KIT FOR MICROWAVE

This is it . . . a screwdriver . . . the only tool needed for quick field replacement of Philco microwave units. Philco microwave is the answer to the need for swift, reliable communications. Philco design emphasizes minimum field maintenance time and cost. All major components are "packaged units", quickly and easily replaced on the site with only a screwdriver, permitting convenient depot checkout, for fullest use of field time.

Using JAN (Joint Army-Navy) specification components wherever applicable, Philco microwave is the only equipment available for commercial use with such high standards of quality. Philco microwave gives propagation and equipment reliability unmatched in the field . . . you should investigate.

For complete information write to Department EW

PHILCO CORPORATION

GOVERNMENT & INDUSTRIAL DIVISION

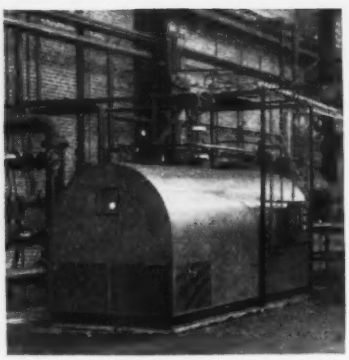
PHILADELPHIA 44, PA.

Yours for REDUCED FIRE LOSSES

CARDOX Experience

The Priceless "EXTRA" You Don't Pay for in CARDOX

Low Pressure Carbon Dioxide Fire Extinguishing Systems*



EXPERIENCE is the one thing that can't be copied.

CARDOX originated and created Low Pressure Carbon Dioxide Fire Extinguishing Systems many years ago.

Since then CARDOX has installed thousands of successful Systems — has held steadfastly to its never-ending research and engineering program for the continuous betterment of CARDOX fire protection.

As a result, CARDOX' experience and knowledge of low pressure carbon dioxide and its application are unapproached—literally years ahead.

This is the priceless "extra" that comes to you with every CARDOX System.

Approved by:
Underwriters' Laboratories, Inc.
Manual Systems—1940
Automatic Systems—1941

Factory Mutual Laboratories
Manual Systems—1942
Automatic Systems—1942

***First Installation*—1939**
Thousands of Systems since, for most of the nation's leading corporations and industries.

*** Covered by U. S. and foreign patents, issued and pending.**

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS • *District Offices in Principal Cities*

retired after 35 years' service with Omaha PPD.

Clarence W. Minard, formerly assistant general manager in charge of power production, distribution, and engineering, will replace Moylan in the number two post. Minard started with the utility in 1919.

C. F. Moulton is the new assistant general manager in charge of power production, distribution, and engineering, succeeding Minard. Formerly superintendent of power, Moulton takes over his new duties after 27 years of experience with the utility.

BALFOUR S. JEFFREY

Kansas P&L Assigns Jeffrey to a New Post

Balfour S. Jeffrey has been appointed to the newly created post of assistant president of Kansas Power & Light Co. Jeffrey formerly was with Doran, Kline, Cosgrove, Jeffrey & Russell, a Topeka law firm which has served Kansas P&L for the past 35 years. The new position was added "to aid in the company's expansion program and rapid growth."

Jeffrey received his AB degree from Kansas University in 1928 and graduated from Harvard Law School in 1932. That same year he became associated with the Topeka law firm. During World War II he served as a major with the judge advocate general's office in Washington.

•

Charles Robbins has been named head of the newly created Nuclear Energy Information Division of Bozell & Jacobs, Inc. New York advertising and public relations agency. Robbins, a

For faster, safer clearance that lasts for years

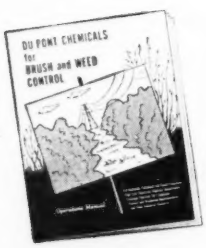
Kill Brush with Du Pont Ammate®

Many users report one spray with Du Pont "Ammate" kills brush so thoroughly that repeat sprays are not needed for years.

In most cases, when the original spray job is done well, brush is kept under control with nothing more than occasional spot sprays starting five or more years later. This assures lower cost brush control with less work for your maintenance crews or custom sprayers.

Here's why "Ammate" works so well.

- **Kills roots of brush as well as tops, yet allows low-growing natural cover to come back.**
- **Control lasts for years, saves labor of hand cutting or annual spraying.**
- **Reducing to a minimum the hazard of damage by spray drift.**
- **Not hazardous to operators, livestock or wildlife. Nonflammable.**



Free illustrated booklet describes how to control brush in rights of way with Du Pont "Ammate." For your copy, write Du Pont, Grasselli Chemicals Dept., Wilmington, Del.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

produced · treated · sold by

J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

Double-Life *Western Larch Poles*

J N *J. Neils Lumber Company*

Pole Division: LIBBY, MONTANA

senior vice president of the agency in charge of its public relations operations, has been assigned for the past two years to follow development of the civilian and industrial aspects of atomic energy. Working with Robbins will be **Vincent R. Fowler,** a vice president of Bozell & Jacobs, and **Don Underwood,** vice president in charge of the agency's Washington office.

Francis M. Weller has retired as manager of industrial power for Consolidated Gas, Electric Light & Power Co of Baltimore. Weller joined the company in 1910.

OBITUARY

Gano Dunn

Gano Dunn, 82, president of J. G. White Engineering Corp, died at New York April 10. Dunn, an electrical engineer, joined White Engineering in 1911. After serving two years as its vice president in charge of engineering and construction, he became president in 1913.

As head of the White organization, he directed numerous construction projects in many parts of the world, including the steam plant at Muscle Shoals, Ala., and three large irrigation and power dams in Chile.

Dunn was the recipient of many professional honors, including the Thomas A. Edison Medal of the American Institute of Electrical Engineers.

Johnston H. Hunt, 60, planning and design engineer for Toledo Edison Co, died March 17. Hunt, an electrical engineer, assumed the engineer's post in 1950.

Bertram H. Lawrence, 70, who retired in 1948 as vice president in charge of engineering of United States Steel Corp, died March 25 at Cleveland. Lawrence, an electrical engineer, started as a hoisting engineer in 1904 with American Bridge Co. a subsidiary of U. S. Steel. In 1906 he went with another subsidiary, American Steel & Wire Company, which he later served as chief engineer. He served as vice president for ten years.

Lloyd F. Jaynes, 50, superintendent of the Canon City Division of Southern Colorado Power Co, died March 31. An employee of the utility for 30

(*Continued on page* 210)

Your CPA

audits the operations of one department

Your ETL

audits phases of operation in these departments

of business

EXECUTIVE
DESIGN
ENGINEERING
PURCHASING
PRODUCTION
LABORATORY
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Each of these departments plays an important role in placing before buyers products you recommend for their safisfaction.

This booklet in all departments will outline ETL services available to them as safeguards for their decisions.

ELECTRICAL
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Government departments require more rigid qualification tests than ever.

ETL is now a recommended qualifying agency.

Nation-wide Service

ELECTRICAL TESTING LABORATORIES, Inc.

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Responsibility...

and the war with

Thirty years ago, when mysterious breakage in overhead conductors was being blamed on "crystallization," Alcoa engineers helped prove that the real villain was fatigue from vibration, caused by air currents.

Ability to define the true nature of vibration problems and solve them came naturally to Alcoa, then as now the first name in aluminum conductors. In the first laboratory built for the purpose, an intensive research program was launched.

Out of thousands of tests came the refinement of Alcoa Armor Rods and Stockbridge Dampers—recognized for the past quarter century as standard protective devices for overhead line conductors.

The sense of responsibility which prompted this program still prevails today. It extends through every phase of design and manufacture to provide you with assurance of outstanding service from Alcoa Aluminum Electrical Conductors.

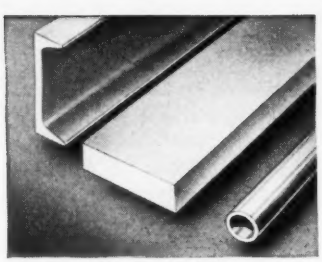
Call your Alcoa sales office for aluminum conductors *and* for accessories that are right—on the line. Aluminum Company of America, 2100-D Alcoa Building, Pittsburgh 19, Pennsylvania.

Alcoa Aluminum

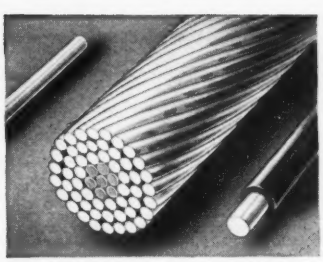
ALUMINUM COMPANY OF AMERICA

"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday—brings the world to your armchair. Consult your newspaper for local time and channel.

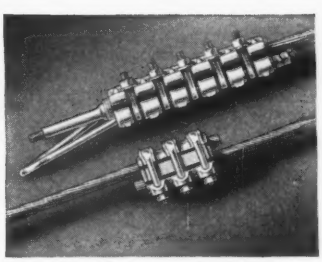
the winds



Alcoa Aluminum Bus Conductors are available in rectangular and round bars, tubes and structural shapes.



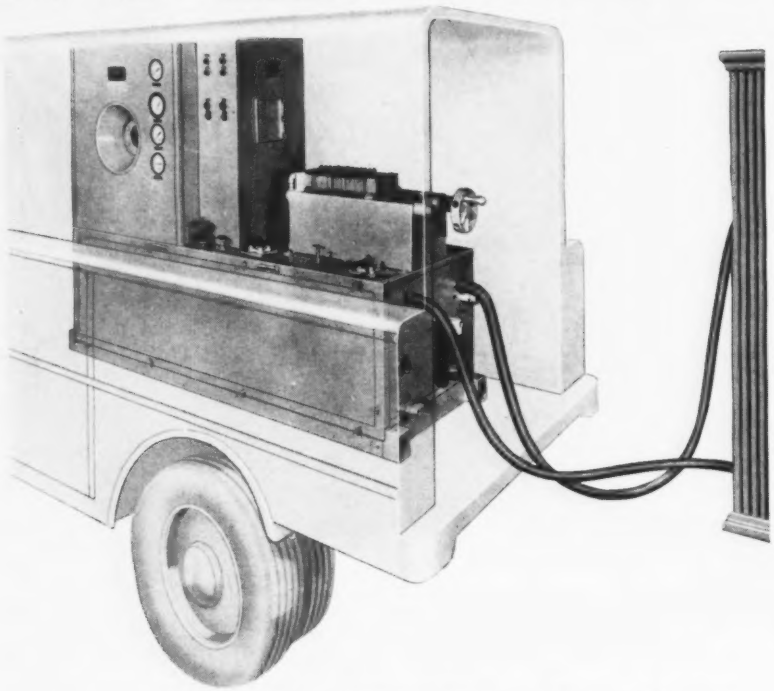
Alcoa Aluminum Electrical Conductors include ACSR, solid and stranded aluminum wire, bare or covered.



Alcoa offers aluminum accessories, correctly designed for use with aluminum conductors.

NO

service interruptions



With BOWSER Hydro-Volifier

In a single pass the Bowser Hydro-Volifier restores oil dielectric to 35 k.v.!

This fully automatic process effectively removes volatile, corrosive acids, gases, dissolved moisture and solids while the equipment remains energized . . . *no service interruptions!*

May we send you complete data?

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Kansas City • New York • San Francisco • Washington, D. C.
Canadian Plant and Sales, Hamilton, Ontario

News About People

(*Continued from page* 206)

years, Jaynes was appointed division superintendent last October.

Lynn B. Orme, 80, retired president of the Salt River Valley Water Users Association, died March 26 at Phoenix, Ariz. Orme, one of the incorporators of the association, had served the organization as president for 14 years before his retirement in 1948.

Joseph S. Cowan, manager of government business at the Washington, D. C. office of National Electrical Products Corp, Pittsburgh, died at Washington March 31. He joined the firm in 1939. Prior to being named manager of government business in the early part of 1951, Cowan had been in charge of wire and cable sales in the company's Washington office for many years.

R. A. Sovik, district sales manager for Copperweld Steel Co's Wire and Cable Division, died April 1. Before joining Copperweld in 1940, Sovik did engineering work for Kellogg-Mann Corp and Central Hudson Gas & Electric Corp.

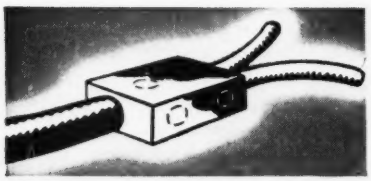
William Pitcher Creager, 74, hydraulics consulting engineer, died at Buffalo, N. Y., April 4. Creager was associated with the J. G. White Engineering Corp from 1906 to 1922. At that time he became chief engineer for the Power Corp of New York. In 1931 he was made a vice president of Northern New York Utilities, Inc, which was later merged with the present Niagara Mohawk Power Corp.

Frank J. Hensel, Sr, 80, retired superintendent of transmission and distribution for Delaware Power & Light Co, died March 25 at Wilmington, Del.

William D. Cochran, 48, a member of the Kentucky Public Service Commission in 1934 and 1935, died in Cincinnati March 23 from injuries received in a recent automobile accident.

Floyd H. Bassett, 79, former utility executive, died March 24 at Watertown, N. Y. He once served as treasurer of Northern New York Utilities, Inc, later merged with Niagara Mohawk Power Corp.

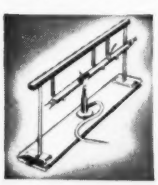
How to get longer life out of your portable cords and cables!



1 USE junction or distribution boxes for making multiple power connections in working places.

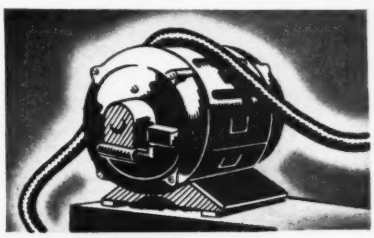
2 PROTECT cables with fuses or circuit breakers of the proper rating for the service. Make sure that circuit breakers will operate properly.

3 PROTECT cables from being run over by heavy equipment. Running over the cable a few times may not cause immediate failure, but may do internal damage which will shorten its life. If the cable must be run across an aisle, place boards on either side as one would for a hose. If it is in use for only a short time, it should be thrown over the truck.

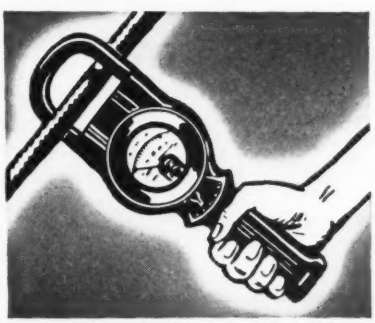


4 USE flame-resistant cables wherever possible.

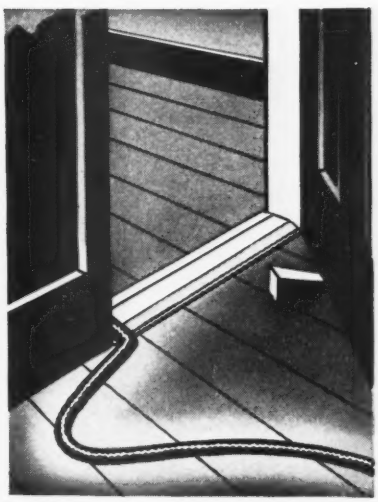
5 DO NOT have portable cords and cables running over steam pipes or other heat-transmitting equipment.



6 KEEP cables away from sparking motors and high voltage equipment. The ozone generated by sparking commutators attacks rubber jackets, causing cracking.



7 AVOID overloading of cables. Where possible, use I.P.C.E.A. recommended current ratings.



8 AVOID dragging portable cords around rough edges or sharp corners. Bruises and cuts hasten deterioration of the jacket. Never yank cords to remove kinks or loosen them when caught on a projection.

9 AVOID running portable cables on pulleys or drums too small for the size of the cable; observe recommended I.P.C.E.A. minimum diameters.

10 KEEP cords away from oils and greases. If they do get into oil, they should be wiped off as soon as possible. Avoid having cords lie in pools of water, chemicals or grease.

11 BUY cables that can carry the required current without overloading or overheating. They should be flexible (have sufficiently fine strands) for the intended use.

FOR FREE REPRINTS OF THIS PAGE, WRITE TO ADDRESS BELOW.

UNITED STATES RUBBER COMPANY

U.S.RUBBER
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Electrical Wire and Cable Department

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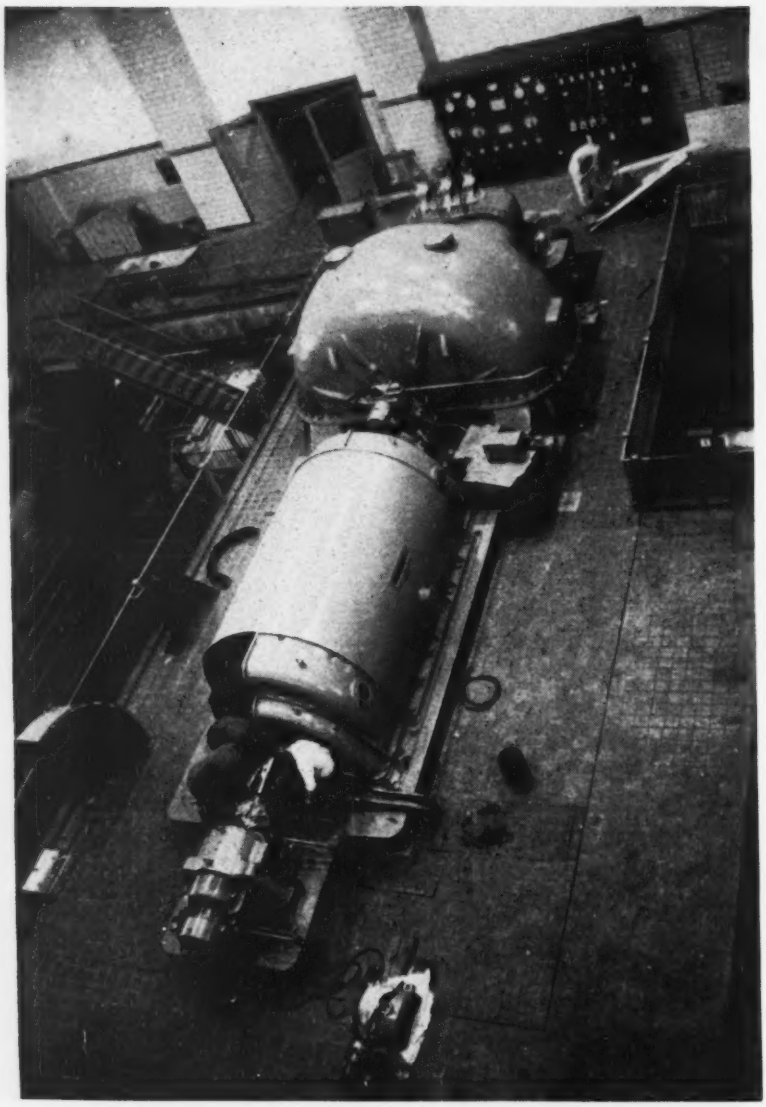


Brown Boveri Unit Put on the Line

The Cleveland Municipal Light Plant recently put this 25,000-kw turbine in operation. The unit is one of two turbines manufactured by Brown Boveri Corp, Switzerland. The second turbine will go on the line in June.

Workmen shown in the foreground are measuring the turbine shaft for sag after the first trial run.

The building that houses this turbine and other units was expanded one and one-half times at a cost of about $2 million.

MANUFACTURERS' EARNINGS

Company	Period Months Ended		Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Kaiser Aluminum & Chemical...	3	Feb.	$1,235,542	$3,008,649	$ .28	$ .80
			1952	1951	1952	1951
Anaconda Wire & Cable (a).....	12	Dec.	$6,275,922	$5,765,586	$7.44	$6.83
A. B. Chance (a).....	12	Dec.	341,779	439,718	1.31	....
Thor Power Tool.....	12	Dec.	1,608,002	1,920,002	2.14	2.56

Notes—(a) These figures have been audited.

Copper Stockpile Buying Halted, Allocations Ended

Two government agencies have taken steps to suspend buying of copper for the stockpile and to end copper purchase curbs.

The Office of Defense Mobilization has announced that the government would stop buying copper for the strategic stockpile for a while in an attempt to bring the price down. ODM said the move was made "to prevent added strain on a market which is not in too plentiful supply." The agency said, however, that existing contracts for stockpile purchases were not affected but for the present no new commitments will be made.

ODM's action is in contrast to a ruling made by another government agency. National Production Authority has ended its tonnage limitations on the purchase of refined copper by brass, bronze, and copper wire mills.

Favorable developments in the overall copper supply have made it possible for NPA to drop the monthly allocation of refined metal, Joseph F. Miller, director of NPA's Copper Division, has reported.

With total decontrol of copper as an ultimate aim, Miller said the NPA ruling will be considered an interim measure effective until June 30, when a further amendment or a revocation of copper controls will be issued.

The domestic copper price difference between large producers and custom smelters has been narrowed to 2¢. The former charge 30¢, the latter, 32¢.

Industry men believe the domestic price, and possibly the foreign price, will level off at 30¢ within several weeks.

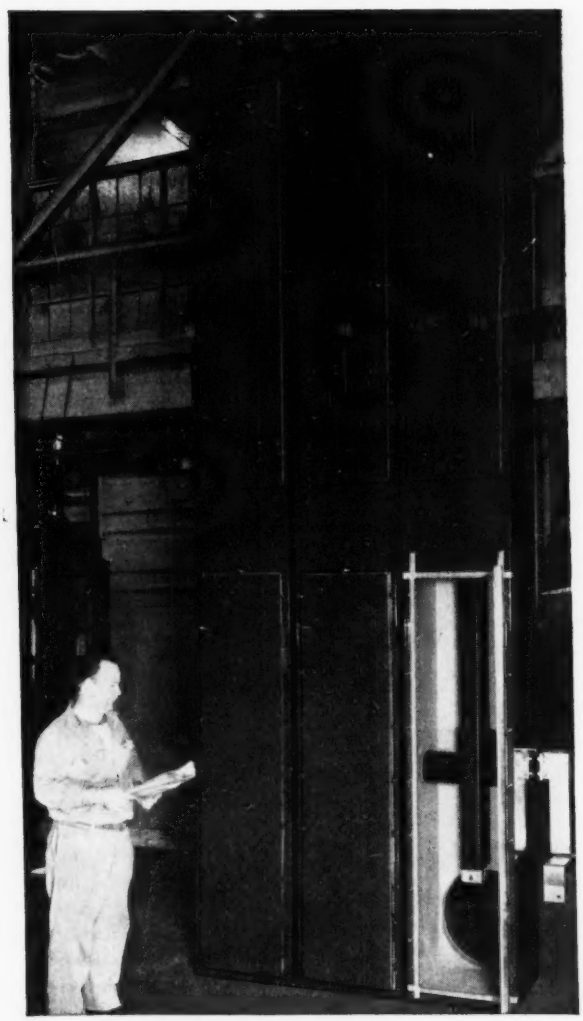
SEC Gets Federal Plan; Pacific Electric Sale Seen

Federal Electric Products Co, Newark, N. J., has filed a registration statement with the Securities and Exchange Commission for 220,000 shares of $1 par common stock and $2 million of 6% subordinated income debentures due 1968 with attached warrants for the purchase of 120,000 common shares. Federal will use the funds from the sale of these securities to acquire Pacific Electric Manufacturing Corp.

FIRST TO SHIP 8-FOOT ISOLATED-PHASE BUS IN ASSEMBLED UNITS . . .

Installing a pre-assembled, 8-foot G-E bus section.

...NOW G.E. CAN SHIP ASSEMBLED BUS SECTIONS 16 FEET LONG



The new 16-foot G-E isolated phase bus section, ready to install.

For years, factory assembled G.E. isolated phase bus has paid off in low installation costs. Crated 3-phase sections arrive ready to lift into place. Now, further savings can be realized by reducing the number of packages to be handled and the number of section interconnections to be made up because new manufacturing facilities permit fabrication of units *up to 16 feet long!* This means real savings in overall installed costs.

Some of the other proved design features of G.E. isolated phase bus which are retained in this new design include:

- Ease of inspection through hinged covers.
- Reduced number of insulation creepage surfaces without sacrifice of mechanical strength.
- Shipment of complete single-conductor assemblies where required.
- Easy facilities for checking and locating sheath grounds.

Your G.E. sales representative has complete information. Ask him for a copy of GEA-5460, a 28-page publication that will aid you in planning your buses, or write to General Electric Company, Schenectady 5, N.Y.

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You can put your confidence in—

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SUBOX guards all three!

STRUCTURES
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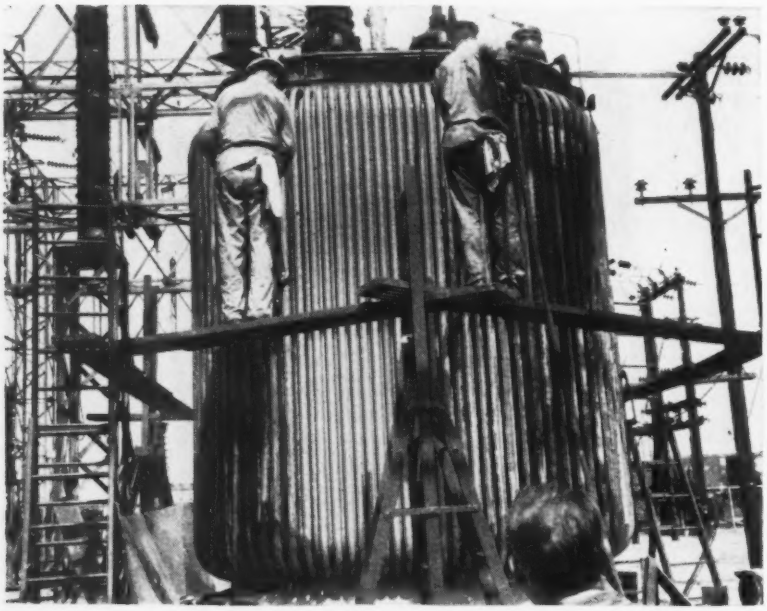
with maximum protection
and minimum application



• Subox paints assure both good radiation and excellent protection for transformers and sub-station equipment. They are easily applied by brush, spray or flow-coating. Use them on your present equipment—specify them on your present equipment—specify them on your new.

• All varieties of Subox and Subalox can now be supplied with a faster-drying vehicle for distribution transformers and other shop work.

• Sub-station structures can often be painted with a single coat and a minimum of outages.

• Industrial-type fences can be amply protected with one coat applied by floor brooms.

For simplified low-cost upkeep, write for free pamphlet "Electric Light & Power Maintenance".

Subox Inc.

3 FAIRMOUNT PLANT HACKENSACK, N. J.

Common stock is to be offered for public sale at $7 per share with an 80¢ per share underwriting commission. Debentures with warrants are to be offered for public sale at 100% of the principal amount of the debentures with 6½% underwriting commission. For each $1,000 of debentures, the attached warrants will entitle the purchaser to buy 60 common shares at prices ranging from $7.50 to $17.50 per share. Principal underwriter is H. M. Byllesby & Co, Inc.

The Newark firm recently entered into an option agreement (EW, Feb. 23, p 93) with certain stockholders of Pacific Electric whereby Federal could purchase their shares of Pacific stock at $90 per share. As of March 26, 1953, 49,026 shares, amounting to 98% of the outstanding Pacific stock, had been deposited under such agreement. Federal has until late May to exercise the option—the exact date was not revealed.

Pacific Electric, which operates plants in Santa Clara, Calif., and San Francisco's Bayview district, manufactures high voltage switchgear. The firm employs 700 workers.

"The property has been valued at $6 million," according to Joseph S. Thompson, president of Pacific Electric. He said the sale would not result in management changes.

MANUFACTURING BRIEFS

McGraw Electric Co has acquired control of Illinois Electric Porcelain Co, Macomb, Ill. Details of the purchase were not disclosed. Illinois Electric, which manufactures high-voltage electrical porcelain for the electrical industry, will be operated as a subsidiary. Company officials said the acquisition was linked to a change in plans for reconstruction of a plant at Kenova, W. Va., for Line Material Co, a division of McGraw Electric. The divisional plant was destroyed by fire last October.

A new factory building with a floor space of 45,000 sq ft is being erected at Galt, Ont., Can., by Allen-Bradley Co, Milwaukee, for the manufacture of its products to serve the Canadian market. Operations will be carried on by Allen-Bradley Canada Ltd, a newly incorporated associate of the American firm.

Give fire half a chance and it will over-run you like a swarm of ants.

You must stamp it out anywhere it shows itself.

In the substation, power plant, garage.

That calls for a battery of strategically placed KIDDE Portable Fire Extinguishers.

Get the ants out of your plants.
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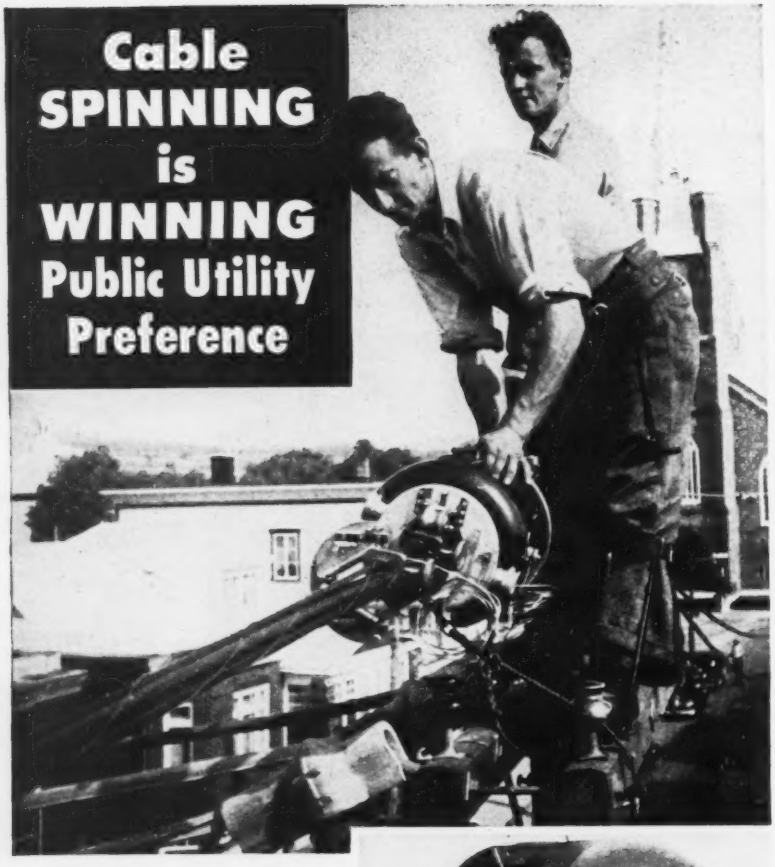
430 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Cable SPINNING is WINNING Public Utility Preference



More and more public utilities every day are turning to the Neale Model "K" Cable Spinner—specially designed for economical and efficient power line use. And here are some of the benefits . . .

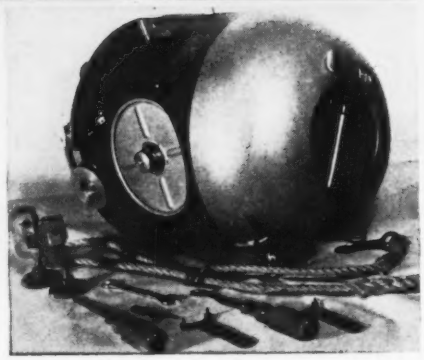
It actually costs much less to install spun cable than pre-assembled cable. And, of course, spun cable saves valuable space in open-wire construction in congested areas.

Light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables . . . to save splices and installation labor.

Spinning reduces cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Cable spinning provides a big margin of extra protection against storm damage . . . and has proved invaluable in emergencies of all kinds.

You're invited to send for full technical details on the Neale Model "K". Just drop a line to Cable Spinning, Topeka. *Neale Spinning Wires available in seven different types and sizes.*



Main illustration shows spinning of cable in Canada. Inset is close-up of the Neale Model "K" Cable Spinner, with accessory tools. Model "K" spins a single cable or three 2" cables into a compact triangular pattern. Strand lies in groove formed by two top cables.

HOW IT WORKS. Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 13" of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, spaced to spiral 6½" apart for ample cable support. Magnesium castings used wherever possible for lightness and strength. Weight is only 36 pounds. Length 18½", 12" diameter, 4¾" wire exit.

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MEETINGS CALENDAR

Electric-Gas Utility Accountants
National Conference sponsored jointly by Edison Electric Institute and American Gas Association, Sherman Hotel, Chicago, April 20-22.

North Central Electric Association
Accident Prevention Committee, Dyckman Hotel, Minneapolis, April 21; Distribution-Equipment Engineering Meeting, Dyckman Hotel, Minneapolis, April 22; South Dakota All-Electrical Industry Meeting, Ward Hotel, Aberdeen, S. D., April 24-25.

American Institute of Electrical Engineers
Southern District Meeting, Hotel Seelbach, Louisville, Ky., April 22-24; Northeastern District Meeting, Sheraton Plaza Hotel, Boston, April 29-May 1; Conference on Electric Heating sponsored by Committee on Electric Heating and Michigan Section, AIEE, Detroit-Leland Hotel, Detroit, May 26-27; Summer General Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 15-19; Pacific General Meeting, Hotel Vancouver, Vancouver, B. C., Sept. 1-4; Middle-Eastern District Meeting, Daniel Boone Hotel, Charleston, W. Va., Sept. 29-Oct. 1; Fall General Meeting, Muehlebach Hotel, Kansas City, Mo., Nov. 2-6.

Pennsylvania Electric Association
Spring Meeting, Meter Committee, Hotel Alexander, Hagerstown, Md., April 23-24; Spring Meeting, Communications Committee, Hotel Roosevelt, Pittsburgh, April 30-May 1; Spring Meeting, Relay Committee, Valley Forge Hotel, Norristown, Pa., May 7-8; Industrial Sales Conference, Galen Hall, Wernersville, Pa., May 7-8; Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, May 12-13; Hydraulic Power Committee, Yorktowne Hotel, York, Pa., May 14-15; Transmission-Distribution Committee, Irem Temple Country Club, Dallas, Pa., May 14-15; Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 21-22; Prime Movers Committee, Beachcombers Resort Hotel, Erie, Pa., May 28-29.

Rocky Mountain Electrical League
Annual Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 26-28.

American Society of Mechanical Engineers
Spring Meeting, Deshler-Wallick Hotel, Columbus, Ohio, April 28-30; Semi-Annual Meeting, Statler Hotel, Los Angeles, June 28-July 2; Fall Meeting, Sheraton Hotel, Rochester, N. Y., Oct. 5-7; Annual Meeting, Statler Hotel, New York, Nov. 29-Dec. 4.

Edison Electric Institute
Accident Prevention Committee, Edgewater Beach Hotel, Chicago, May 4-5; Transmission-Distribution Committee, Edgewater Beach Hotel, Chicago, May 5-6; Electrical Equipment Committee, Sir Walter Hotel, Raleigh, N. C., May 11-12; Meter-Service Committee, Wentworth-by-the-Sea, Portsmouth, N. H., May 25-27; 21st Annual Convention, Convention Hall, Atlantic City, N. J., June 1-4; Hydraulic Power Committee, Portland, Ore., June 15-16.

Northwest Electric Light & Power Association
Business Development Section, Davenport Hotel, Spokane, Wash., May 4-6.

Public Information Program
West North Central Regional Meeting, Russell Lamson Hotel, Waterloo, Iowa, May 5-6.

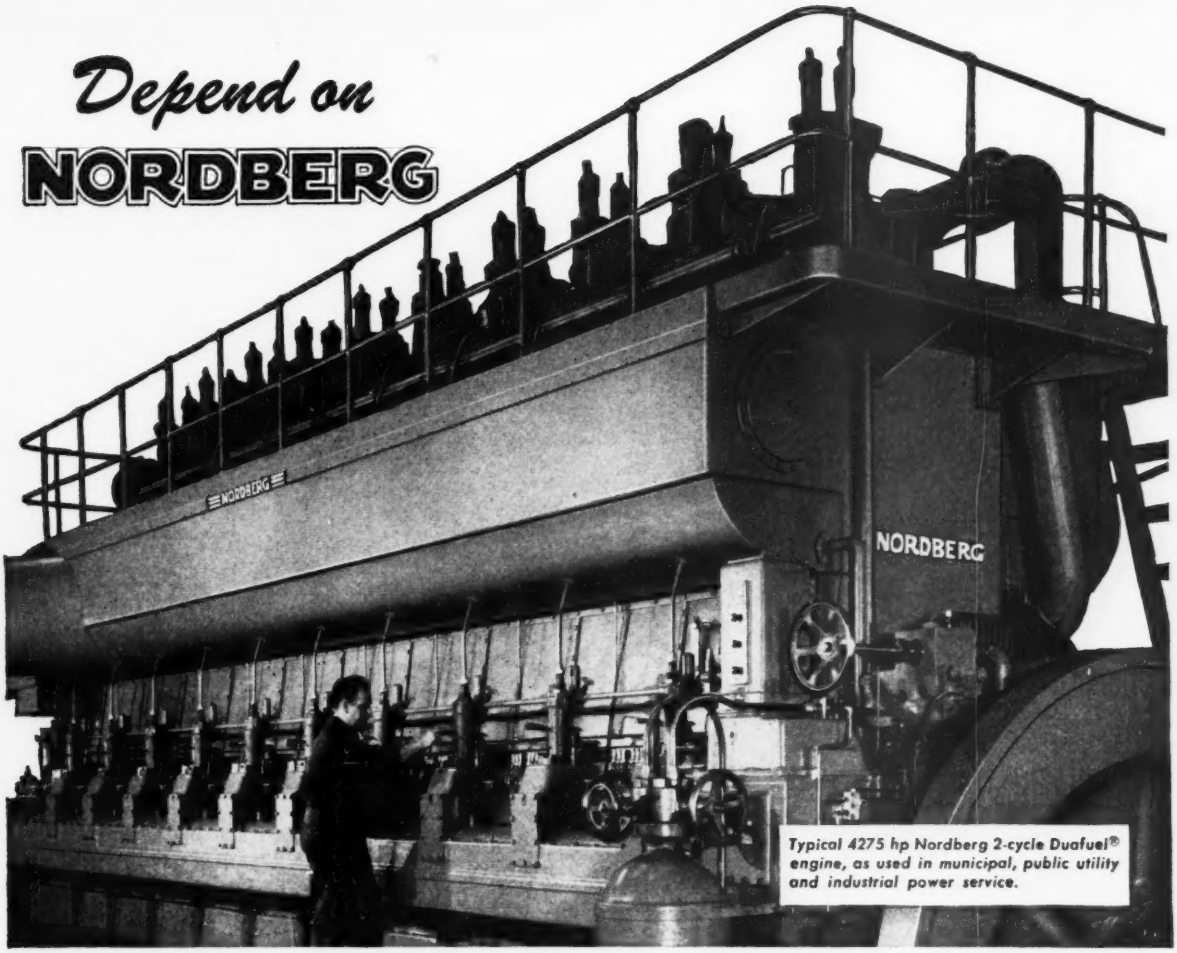
Electric Lines Club of New England
Spring Meeting, University Club, Boston, Mass., May 6.

Northwest Public Power Association
Annual Convention, Ridpath Hotel, Spokane, Wash., May 6-8; Accounting Section, Monticello Hotel, Longview, Wash., Sept. 17-18.

Great Lakes Power Club
Spring Meeting, Indianapolis Athletic Club, Indianapolis, Ind., May 7-8.

Public Utilities Advertising Association
National Convention, Chase Hotel, St. Louis, May 7-8.

Depend on NORDBERG



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Advanced engineering results in less maintenance cost per kilowatt-hour.

Nordberg Engines are now built in sizes from 10 to over 10,000 horsepower in a single engine . . . including Diesel, Duafuel® and Spark-Fired Gas Burning types.

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Strong...
to support pole structures under adverse ice and wind loadings.

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to withstand the punishment incurred in construction and service.

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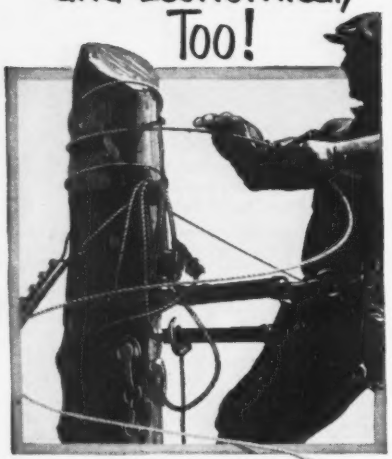
provided by famous *Crapo* Galvanized heavy, ductile, tightly-bonded zinc coatings.

-and Economical, Too!



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REINFORCE and PROTECT YOUR CONDUCTORS with Preformed ARMOR RODS

Minimize wear and chafing . . . Absorb and dissipate vibration . . . Protect against arcing and flash-overs . . . Increase holding power against slippage . . . Lessen possibilities of corrosion . . . *Reduce overall maintenance costs.*

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

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Chicago Electrical Industry Show
Sponsored by Electric Association and Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, May 11-14.

American Public Power Association
Tenth Annual Convention, Sheraton Plaza Hotel, Boston, May 12-14.

Pacific Coast Electrical Association
Annual Convention, Hoberg's, Lake County, Calif., May 13-15.

Georgia Institute of Technology
Conference on Protective Relaying, Atlanta, Ga., May 14-15.

Illuminating Engineering Society
East Central Regional Conference, Lord Baltimore Hotel, Baltimore, Md., May 14-15; Southern Regional Conference, Sedgefield Inn, Greensboro, N. C., May 18-19; Great Lakes Regional Conference, Syracuse Hotel, Syracuse, N. Y., May 25-26; National Technical Conference, Hotel Commodore, New York, Sept. 13-17.

Third International Congress on Electro-Thermics
Paris, France, May 18-23.

Electrical Manufacturers' Representatives Association of Michigan, Inc.
1953 Electrical Exhibition, State Fair Grounds, Exhibition Bldg., Detroit, May 19-22.

Southeastern Electric Exchange
Industrial Power Sales Conference, Fort Sumter Hotel, Charleston, S. C., May 21-22.

Interstate Power Club
Joint Meeting with Power Engineer's Association, Lawn Club, New Haven, Conn., May 22; Hotel Martinique, New York, Oct. 5; Hotel Martinique, New York, Dec. 7.

National Association of Purchasing Agents
Annual Meeting, Statler Hotel, Los Angeles, May 24-27.

National Association of Electrical Distributors
45th Annual Convention, Conrad Hilton Hotel, Chicago, May 24-29; Spring Meeting, Pacific Zone, Huntington Hotel, Pasadena, Calif., June 8-10.

California Municipal Utilities Association
Annual Conference, Clift Hotel, San Francisco, June 9-12.

New England Meter Engineers
General Electric Co's Meter Plant, West Lynn, Mass., June 12.

American Welding Society
Exposition held in conjunction with National Spring Technical Meeting, Shamrock Hotel, Houston, Tex., June 16-19.

Michigan Electric Association
Annual Meeting, Mackinac Island, Mich., June 21-24.

Canadian Electrical Association
Annual Convention, Manoir Richelieu, Murray Bay, Que., June 25-27.

American Society for Testing Materials
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 29-July 3.

International Association of Electrical Leagues
18th Conference, Fairmount Hotel, San Francisco, Aug. 5-8.

Maryland Utilities Association
Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 18-19.

Instrument Society of America
8th National Instrument Exhibit, Sherman Hotel, Chicago, Sept. 21-25.

National Electrical Industries Show
Sponsored by Eastern Electrical Wholesalers' Association, 69th Regiment Armory, New York, Sept. 29-Oct. 2.

National Electrical Manufacturers Association
Annual Meeting, Haddon Hall, Atlantic City, N. J., Nov. 9-12.

***Wisconsin Utilities Association**
Sales and Service Section Convention, Schroeder Hotel, Milwaukee, Nov. 11-13.

*Addition this week.

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KLEIN-KORD

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SAFETY STRAPS

Count on being really satisfied with Klein-Kord *nylon* Safety Straps. They're smooth and flexible, require no special care—and give you that important extra margin of safety. Made of multiple plies of strong, finely woven *nylon*, bonded together with frictioning and vulcanized in neoprene. Red center is a safety signal to "Stop When You See Red!" Equipped with finest drop-forged hardware.

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Skill replaces guesswork when Bartlett takes care of your trees. Tree life, tree health, tree diseases, tree enemies are too complex to be understood thoroughly by any but those qualified by study, training and experience.

Fine shade trees are an investment, but one that can *appreciate* or *depreciate* depending on the care that is given them. Like any investment they must be jealously guarded in order to derive the greatest return in value and enjoyment. Of all the priceless possessions with which nature has endowed mankind, trees are the most spectacular . . . a miracle of living beauty revisited each year. Trees are the heritage for all mankind, for young and old, for rich or poor, in every land, to enjoy, to use, to appreciate.

But the most important trees are *your* trees. That's why the best care you can give your trees is the Bartlett Way. The achievements of the Bartlett Way are not accidents. They represent the result of many years of painstaking research and experiments by the Bartlett Tree Research Laboratories. Each and every process, technique, material and tool used in Bartlett tree care is the result of cumulative years of knowledge and experience, of study and development. It is the Scientific Way . . . that gets to the root of all tree trouble.

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THERMAL RISE IS NOT SO LIMITED

Continuous Operating Temperatures up to 650°F. can be endured by Mycalex glass-bonded mica. Temporary rises even higher than that are feasible. The familiar old limitation of the temperature endurance of insulation can be pushed away up.

ACCURACIES CAN BE HIGHER

Mycalex Insulation can be produced to any precisions of which any metal is capable. Mycalex is dimensionally stable; it holds its precisions. Electrical components insulated with Mycalex can be fitted into permanent precision assemblies.

IT ALL ADDS UP TO GREATER CAPABILITY IN LESS SPACE

Mycalex Insulation is corona resistant, does not carbonize under arc, has nil moisture pick up. It all adds up to getting greater capability in less space by specifying Mycalex Insulation.

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GENERAL OFFICES AND PLANT
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Air Conditioners

(*Continued from page* 120)

rate. However, this torque is usually of a negligible magnitude. The net result is increased motor losses, higher winding temperature, slightly reduced speed, and slightly decreased breakdown torque.

Voltage complaints from air conditioning service men have been investigated to determine the unbalance factor, with results as shown in Fig 2. While the unbalance ranged up to 5.8%, half of the cases had less than 2.8%. The small number of complaints experienced below 2% unbalance suggests that this may be a safe condition.

The four-wire delta secondary system cannot generally deliver 100% balanced three-phase voltage although the inherent unbalance of this system is well within controllable limits. It is commonly used, however, because metering and transformer costs are lower than for other commonly used systems and it facilitates supplying new three-phase load from the existing single-phase secondary system. (Single-phase loads of 120/240-volts and metering are not disturbed.) In order to keep the voltage unbalance and voltage drops within acceptable limits, it is necessary that the percent impedance of the transformers, secondaries, and service be kept within certain maximum values for a given combination of single-phase and three-phase.

The rigorous calculation of voltage unbalance on a four-wire delta system supplying voltage to a three-phase motor is a very difficult and arduous task. This is further complicated by the fact that the running motor becomes a balancing device. Another complicating condition in practice is due to the fact that magnitude of the single-phase load and that of the three-phase load vary independently of each other. The solution of the problem involves assumptions of single-phase and three-phase components of load together with their power factors.

A comparison of several of the various factors which might cause unbalanced voltages is shown in the tabulation. It will be noted that primary unbalance to neutral together with open-wye, open-delta banks may be one of the worst offenders. Because of the large economic advantage of serving scattered three-phase loads

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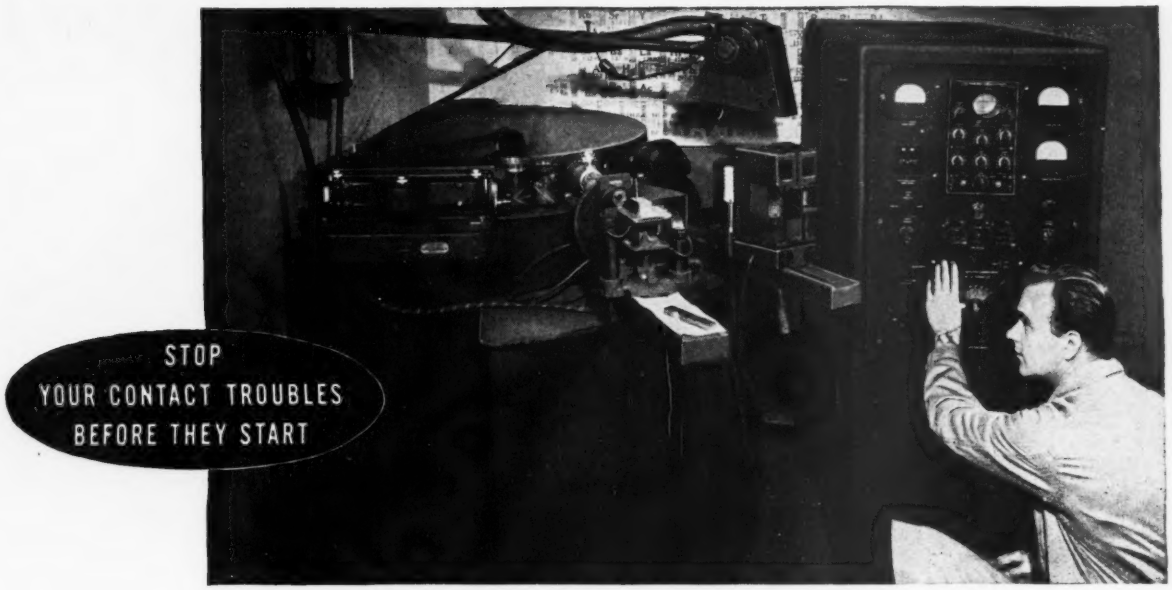

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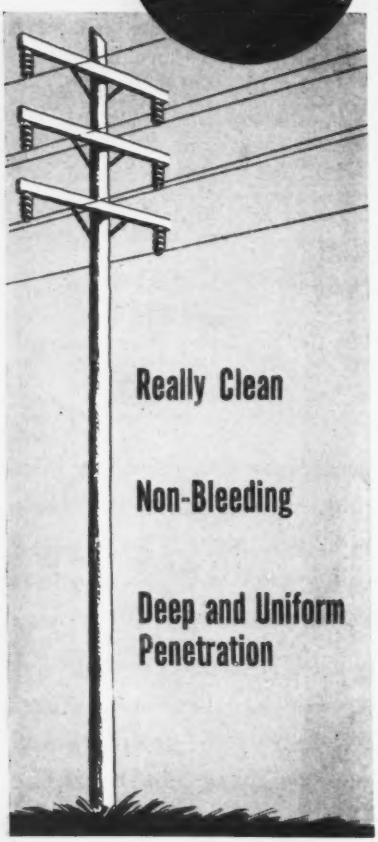

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with open-wye, open-delta banks, the necessity for maintaining a more balanced primary becomes imperative. This effort in balancing has led several utilities in this area to record and map the transformers with respect to each phase.

The possibility that transformers may have their taps set on different ratio should not be overlooked. Many times trouble men have adjusted taps to achieve a more balanced secondary voltage during some hot afternoon when the customer's motor was tripping "off." Later balancing of primaries did not automatically correct the tap settings.

Protection to customers' equipment is a mutual problem and concern of both manufacturer and utility. Unfortunately the usual forms of motor overload protection at most protect only two phases. Extension of this protection to all three phases should help materially in reducing motor burnouts from voltage unbalance.

FINANCIAL

(*Continued from page* 124)

the Supreme Court said Congress never intended that the states should have the sole right to regulate sales of electric power. While Congress had reserved the bulk of power rate regulation to state bodies, said the majority, ". . . There is no evidence that this was done with any firm intent to settle with the states a power essentially national." Justice Stanley F. Reed wrote the majority opinion, which relied heavily upon legislative history of the Federal Power Act.

BPA Wholesale Rates May Go 10 to 25% Higher

Customers of the Bonneville Power Administration at a meeting recently in Seattle didn't learn very much about Bonneville's proposed new wholesale rates expected to take effect in December, 1954, except that they will be anywhere from 10 to 25% higher than present rates.

The rates cannot be set until a number of imponderables can better be taken into account, said William A. Dittmer, Bonneville power manager. Unknown factors include future allocation of flood control, reclamation and power costs in multi-purpose dams; timely construction starts on proposed projects such as Libby and

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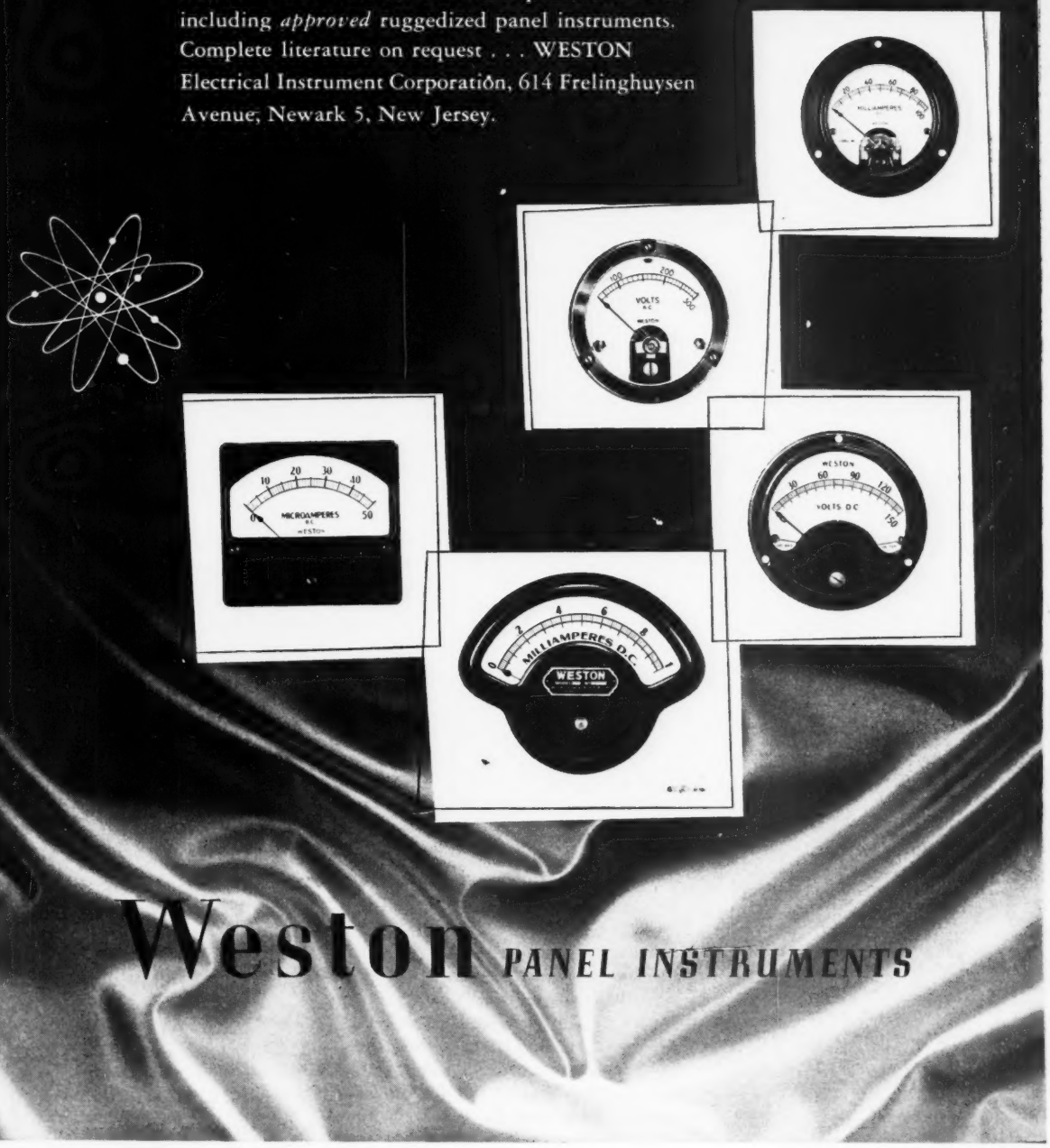

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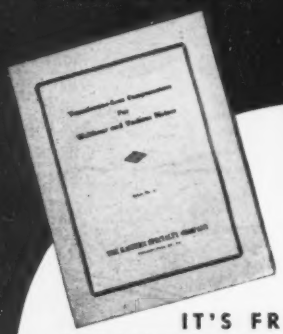

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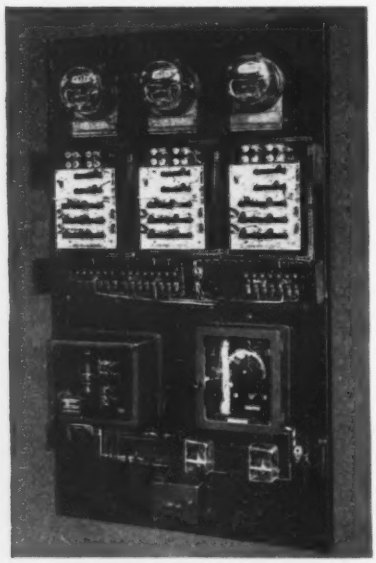

HERE ARE TESCO Transformer-Loss Compensators on a two-element 6.6 KV 18,750 KVA metering installation with three transformer banks. Metering is compensated to the 66 KV dual service supply. Compensator and panel covers removed.

EASTERN

SPECIALTY COMPANY

PHILADELPHIA 40, PA.

Hells Canyon dams; and a possible differential between firm and interruptible power rates, now the same.

New power requirement contracts may include a provision that utilities must obtain permission from BPA before negotiating a contract with a customer for more than 5,000 kw, Dittmer said.

Paul J. Raver, Bonneville administrator, declared the agency would have no power for direct sale to new industries until 1957 other than 120,000 kw earmarked for an aluminum plant near The Dalles, Ore., with private power companies to get the next 500,000 kw of new power to be generated by federal plants. Only a worsening of the international situation, with a consequent further allocation of power to defense industries, could affect this commitment to the private power companies, Raver said.

Niagara Mohawk Acquires Power Firm's Facilities

Sale by the Eastern New York Power Corp of the Corinth Electric Light & Power Co to Niagara Mohawk Power Corp for $500,000 has been approved by the New York Public Service Commission.

The PSC also sanctioned as part of the transaction, the purchase by Niagara Mohawk of stock held by Eastern New York Power in the Moreau Manufacturing Co, which operated a power plant on the Hudson River.

In the same opinion, the PSC approved purchase by Niagara Mohawk for $8 million of properties on the Hudson and Black Rivers held by Eastern New York Power.

FINANCIAL BRIEFS

Public Service Co of Colorado has asked Public Utilities Commission approval to sell 65,000 shares of 4½% preferred stock at $100 a share to institutions . . . **General Public Utilities Corp** is planning to sell about 570,000 shares of common stock to stockholders on a 1-for-15 basis about June 4 . . . **Philadelphia Electric Co's** Chairman H. P. Liversidge told the company's annual stockholders meeting that the "time is not far distant when stockholders have a right to expect an increase in dividend."

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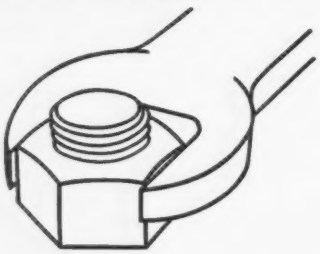

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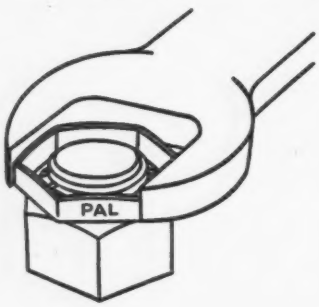

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BOOK REVIEWS

Electronics

Vacuum-Tube Oscillators. **By William A. Edson. Published by John Wiley & Sons, Inc., New York 16, N. Y. 484 pages, illustrated. Price $7.50.**

Vacuum-tube oscillators form a part of almost every transmitter or receiver for radio, television and radar. But they are found also in such varied fields as induction heating and laboratory instrumentation. These oscillators actually depend upon the characteristics of the circuit in which the vacuum tube is merely a control device. Because of the diverse applications, the literature has been scattered, and the analytical methods and notations confusing.

The author attempts in this book to coordinate the scattered literature into a logical sequence with uniform notations. He employs mathematics freely and develops relationships from fundamental considerations. Extensive consideration is given to the circuits and their frequency-controlling elements. An extensive bibliography is included.

Considerable understanding of electrical circuits and vacuum tubes is desirable for effective use of the book. As a text book, it should be suitable for senior and graduate students. But its comprehensive coverage should make it valuable also as a reference for engineers concerned with the design and application of electronic communication or control and with high-frequency devices for industry

Surveying

Route Location and Surveying. **By T. F. Hickerson. Published by McGraw-Hill Book Co, New York 36. 543 pages, illustrated. Price $6.00.**

The two earlier editions carried a "highway" title but the scope has been broadened to include pipe lines, airports, with an "etc" that includes transmission lines. Mention of aerial surveying is brief and thus the book means most to a power man in terms of the orthodox rod and transit method of laying out a route, a dam, or a penstock. Tables take up half the pages.

Radio Test Equipment

Basic Electronic Test Instruments. **By Rufus P. Turner. Published by Rinehart Books, Inc, New York 16, N. Y. 263 pages, illustrated. Price $4.00.**

Radio equipment testing today involves use of several basic instruments, such as voltmeters, milliammeters, ohmmeters, oscilloscopes and test oscillators. Electronic methods are essential in some, desirable in others. This book is intended to acquaint the technician with the use of typical instruments, and the construction of some devices not otherwise available. It is clearly written and profusely illustrated for a reader with basic knowledge of radio and electronic theory.

The recent wide acceptance of microwave communication and control systems for utility use, together with mobile space radio, have brought new problems to men without electronic experience. This book would aid them in selecting proper instruments and techniques for maintaining the new equipment.

Handbook

Taschenbuch fur Elektrotechniker. Band I: Grundlagen. **By F. Moeller. Published by B. G. Teubner Verlagsgesellschaft, Leipzig, Germany. 520 pages, illustrated. Price 19DM.**

This initial volume of the handbook of electrotechnology is devoted entirely to fundamentals i.e. to mathematics, fields, circuits, measurements and the materials of electrical engineering. The editor has

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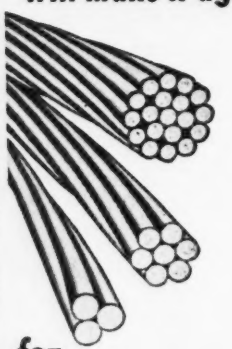

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Tungsten

Tungsten; Metallurgy, Properties, Applications. By C. J. Smithells. Published by Chemical Publishing Co, Inc., New York 10. 326 pages, illustrated. Price $8.50.

The ores from which tungsten is derived, modified and refined along with the details of these operations constitute the first third of this book. Difficult techniques of rendering the metal ductile for drawing are taken up in the ensuing chapter. Then follows the metallography and the effects of cold working of the material. Thermionic properties, characteristics in iron and non-ferrous alloys, the properties of tungsten carbides round out the comprehensive study of this tough and critical metal. China has been the heaviest producer.

Refrigeration

Refrigeration Data Book, Applications. By H. C. Diehl. Published by American Society of Refrigerating Engineers, New York 18. 950 pages, illustrated. Price $7.50.

Revised three times since 1940 this volume remains the authoritative source of information about refrigeration applications because the data has been compiled by over 60 recognized experts. Subject matter has been arranged under 8 major sections dealing with such fields of electric power interest as frozen foods, refrigerated processing and warehouses, industrial applications, comfort air conditioning. Product quality and thermal data are stressed throughout and supplemented by quantitative tabulations of direct use in computing power requirements.

Control

Controllers For Electric Motors. By H. D. James and L. E. Markle. Published by McGraw-Hill Book Co, New York 36, N. Y. 418 pages, illustrated. Price $7.00.

This is a second edition. It contains practical and useful information covering design, application, operation and maintenance of industrial controllers; also recent developments including magnetic amplifier, the dynamo electric amplifier, magnetic clutches, ac and dc crane control and remote and supervisory control. The book is written for engineers as an aid to the selection of controls for machines and tools, but it should be useful to engineering students in applying theory to control systems.

Reminiscence

I Remember. By Dexter S. Kimball. Published by McGraw-Hill Book Co, New York 36. 259 pages, illus. Price $4.00.

Logging and mining camps were Kimball's early schooling, but he switched abruptly to the electric-mechanical factory—the Stanley plant which was the genesis of the General Electric works at Pittsfield. Next he joined the Cornell faculty again in 1904 to become acting president in 1918 (also 1929) and dean of engineering in 1920. No one was ever more modest in reminiscing about his experiences, his achievements and his friends in top circles. Kimball has no truck with the creeping socialism of the last quarter century. Here he shows why he so uniquely typifies the American spirit of enterprise.

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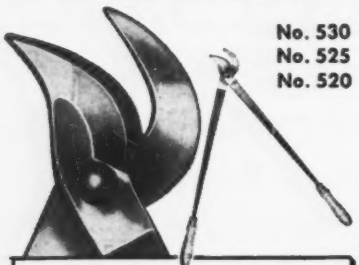

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- During every one of the past 21 months, redemptions of unmatured Series E Bonds have been well under 1% of the total amount outstanding.
- 1953 figures should be even better—more than 1,000,000 Americans joined the Payroll Savings Plan in 1952, and thousands, literally, are enrolling every day.
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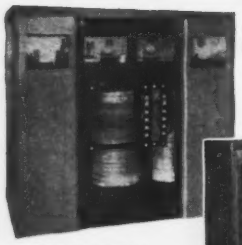

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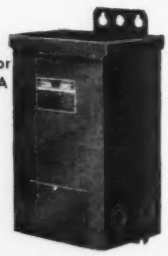

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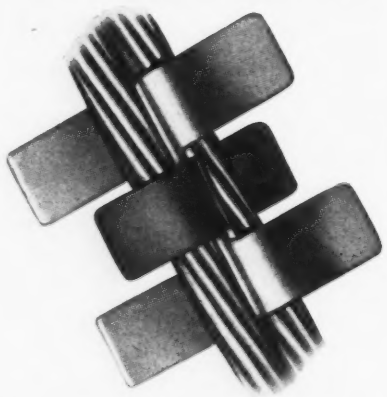

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CATALOGS • BULLETINS

• **GENERAL CATALOG:** The 1953 edition of the Trumbullist, general catalog of the Trumbull Electric Department of the General Electric Company, Plainville, Conn is off the press and initial distribution is now being made to electrical distributors, contractors, engineering and architectural firms, and plant electricians. This up-to-the-minute catalog contains complete listings of safety switches, circuits breakers, service entrance equipment (both fusible and circuit breaker types), motor control and an extensive line of panelboards.

• **ELECTRICAL EQUIPMENT FOR MILLS:** Electrical equipment for woolen and worsted mills is the subject of a new 40-pg booklet available. Starting with the opening and picking rooms and going through the mill to the finishing department, this booklet discusses the types of equipment available, their applications, and the special design characteristics of each. Among the standard apparatus so appraised are motors, controls, and gearmotors. Among other subjects covered are lighting, power systems, maintenance service, and air conditioning. For a copy of this booklet, B-4798, write Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pennsylvania.

• **PLUNGER RELAYS:** Ebert Electronics Co have announced that their new catalog describing their mercury plunger relays is now available. Seven different types are described and pictured. Technical specifications and construction details are also given. For a free copy, write to the company, 185-09 Jamaica Avenue, Hollis 7, New York.

• **SOLDER PRODUCTS:** A new bulletin which covers regular solder products including anchor shurflo rosin core solder, solid wire solder, bar solders, ribbons, preforms is now available. These solders are ready in all standard alloys for radio, electrical, electronic, radar and similar application. Special solders in the low temperature and high temperature range are also available on short notice. Bulletin #52-A is available on request. It may be obtained on request from Anchor Metal Co, 244 Boerum Street, Brooklyn 6, N. Y.

• **PLASTISOLS:** An extensive group of plastisols, designated the Hysol 3000 Series, is described in a new four-page bulletin published by Houghton Laboratories, Inc. These plastisols are dispersions of high molecular weight polyvinyl chloride resins in selected liquid plasticizers. Available in a variety of different forms, they offer corrosion protection, abrasion resistance and electrical insulation. Copies of the bulletin on the Hysol 3000 Series of plastisols can be obtained from Houghton Laboratories, Inc, Olean, N. Y.

• **GEAR DRIVES:** An interesting bulletin in full color describes in detail a new Holloshaft Gear Drive to operate vertical turban pumps where electricity is not available. Cut-open views show many new features. A copy of the bulletin may be obtained by addressing your inquiry to U. S. Electrical Motors, Inc, P. O. Box 2058, Los Angeles 54, Calif.

• **TELEPHONE NETWORK:** Application of a railroad-owned, long-distance telephone network in the administration and operation of the Louisville & Nashville Railroad is presented in a new illustrated 12-pg case history published by the manufacturer of P-A-X Business Telephone Systems. Specific use, advantages and economies provided by this direct telephone communication are discussed in de-

tail, and general specifications of telephone equipment are listed and illustrated. Write the Automatic Electric Sales Corp, 1033 W Van Buren St, Chicago 7, Ill.

• **ELECTRICAL PRODUCTS:** A new 16 pg catalog of Viking Electric, 1061 Ingraham Street, Los Angeles 17, California, is just off the presses and is ready for free distribution. This loose-leaf catalog gives engineering specifications and templates of miniature connectors, terminal boards, thermocouple connectors and printed circuit hardware. Write to Dept "Q" at the above address for your free copy.

• **NICKEL CADMIUM BATTERIES:** A 4-pg bulletin describing the engine starting characteristics of nickel cadmium batteries, has been issued by the Nickel Cadmium Battery Corp, 100 Park Avenue, and is available upon request. The booklet discusses the principles behind the low-internal-resistance and negligible self-discharge qualities of NICAD batteries.

• **FASTENERS:** A comprehensive, 36-pg catalog covering the complete, expanded line of fasteners has just been issued by Simmons Fastener Corporation, North Broadway, Albany, New York. These fasteners are suited for widely divergent applications throughout the electrical, automotive, railroad, aviation, building, furniture, domestic appliance and other industries. Copies of this colorful catalog, No 1252, can be obtained by writing Mr Harry Rose, General Manager, at the above address.

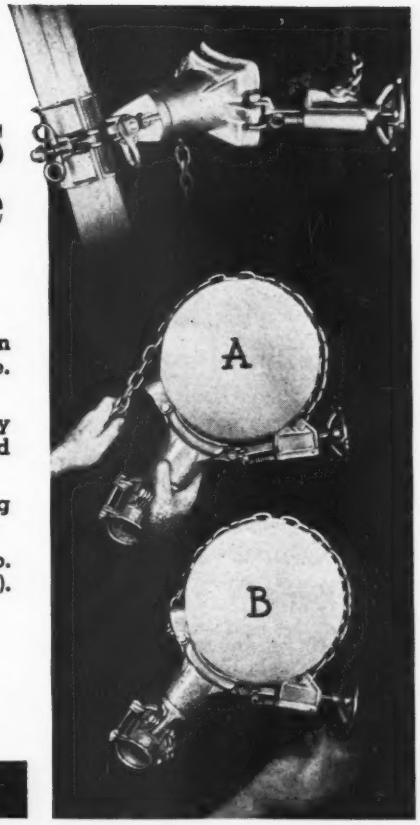
• **TAPES:** A new 12-pg, illustrated booklet describing "Scotch" brand electrical tapes and related electrical products for construction and maintenance has been announced by Minnesota Mining and Manufacturing Co, 900 Fauquier St, St Paul, Minn. The booklet discusses use of "Scotch" plastic electrical tapes Nos 21, 22, and 33 in industrial and house wiring, appliance repair, underground cable splicing, and other heavy-duty applications. Also described and illustrated are such new accessory products as "Scotchlok" electrical insulation putty for insulating and padding large connectors and other irregular surfaces prior to taping, and "Scotchkote" electrical coating for use as an outer seal on plastic tapes subjected to abnormal quantities of oil or contaminated water. The booklet is available upon request from the manufacturer.

• **INDUSTRIAL CONTROLS:** Complete information on Barber-Colman Industrial Controls is now available in the new Industrial Control Catalog F3941-2. It covers control terminology, thermostats, proportioning pressure switch, humidity controls, types of valve bodies, motor-operated valves, solenoid valves, valve capacities, temperature regulators, control motors, relays, electrical accessories, heating & air conditioning controls, and other products. Address your request to the Barber-Colman Company, Rockford, Illinois.

• **SOOT BLOWERS:** Bulletin 1004 discusses fifteen central station installations of Vulcan Automatic-Sequential soot blower systems. Power and reheat boilers with capacities to 1,370,000 pounds per hour, pressures to 1925 psi and temperatures to 1055 F are included. Blowing medium is stream or air, and units are power-driven by air or electric motor. 32 pgs. Write Copes-Vulcan Division, Erie 4, Pennsylvania.

• **BOILER CONTROL:** A new 10 pg bulletin No 1007 illustrates and describes the new Copes-Vulcan Boiler Control with instrumentation by Taylor. Includes com-

HOT LINE MAINTENANCE IS EASIER with DIECK'S New Light Alloy Wire Tong Saddle



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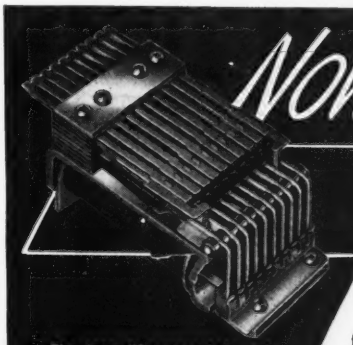

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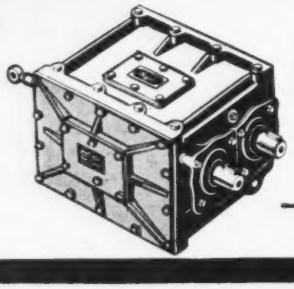

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bustion, feed water, boiler steam temperature and soot blower controls. Standard or miniature instruments and conventional, console or graphic panels. Copes-Vulcan Division, Erie 4, Pennsylvania.

• **CONTROL PANELS:** Advantages, descriptions and uses of Pantro Industrial Control Panels are clearly illustrated and described in a new 2-color, 2-pg catalog sheet, punched for ring binder files. It will be helpful to everyone interested in automatic control panels. Free copies will be mailed upon request to Industrial Control Panel Co, designers and manufacturers, 247 East Illinois St, Chicago 11, Ill.

• **SUPER CYCLONE FURNACES:** A new 8 pg, two color bulletin on Gas-fired and Electric Super Cyclone furnaces has just been issued by Lindberg Engineering Company. The bulletin contains photographs, diagrams and specification charts on all types of "Lindberg Super Cyclones." Operation, design features and the wide range of uses for annealing, normalizing, tempering, nitriding and special heating are briefly explained. Request your copy of Bulletin No 131 from Lindberg Engineering Company, 2450 West Hubbard Street, Chicago 12, Illinois.

• **METERING:** This new brochure explains the important influence of modern metering on the revenue of the Electric Power Industry. "Metering for Profit" is an illustrated, non-technical report of interest to all utility company personnel. The brochure tells the story of modern watthour meters—how they are made and how they serve the power company's interests most effectively. A copy may be obtained by writing Sangamo Electric Company, Springfield, Illinois.

• **MAGNETS:** "Nickel containing alloys For Permanent Magnets," 16 pgs, with 8 graphs and list of sources of supply is now available. Reviews the commercially available permanent magnet alloys, especially the Alnico family. Advantages and limitations of these are high-lighted. Characteristics of ductile permanent magnets (cunife and cunico) and of special permanent magnets (silver or platinum alloys) are described. Table gives representative magnetic properties and composition of 23 alloys. Write for copies to International Nickel, Dept. EZ, New York 5, N. Y.

• **CIRCUIT BREAKERS:** A new manual explaining operating principles of basic circuit breaker designs, and providing engineering data on factors of application has just been published by the Heinemann Electric Co, Trenton 2, N. J. While the manual is concerned mainly with branch circuit protection, it should be of informative value to anyone concerned with circuit breaker application. Copies of Manual 101 are available upon request to the Heinemann Electric Co, 324 Plum Street, Trenton 2, N. J.

• **ARC WELDING:** This booklet of 32 pgs contains reprint of material from the Procedure Handbook of Arc Welding Design and Practice, and was published so as to make this information more generally available. It covers welding of chromium-nickel steels, with and without molybdenum, as well as the welding of straight chromium steels, together with complete procedures. Contains analysis of most of the types of such steels. Also gives A.W.S.-A.S.T.M. classifications of corrosion-resisting chromium and chromium-nickel steel welding electrodes (Specification A298-48T). This booklet is available from Lincoln Electric Company, 22801 St Clair Avenue, Cleveland 17, Ohio, and is priced at $.25 postage prepaid, anywhere in the United States.

ILLUMINATION ENGINEERING

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New, more complete 2nd edition covers fundamentals of illumination, types of illumination devices, and their engineering applications. Provides rigorous treatment of spectral and spatial interrelationships among various entities at the source and receiver surfaces. Gives details on design of both interior and exterior illumination systems. New chapters on color, interreflection method of design, ultraviolet and infrared sources and applications. **By Warren B. Boast, Professor of Elec. Eng., Iowa State College. Second Edition, 340 pages, 130 illustrations, $7.00**

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Tells how the electron tube makes industrial processes simpler, cheaper, safer. Explains operating principles of components, tubes, and circuits applied to industrial problems of control, measurement, electronic heating, motor speed control—counting, sorting, and grading. Describes amplifiers, thyratrons, phototubes, and cathode-ray tubes and applications. **By Keith Henney, Editorial Director, and James D. Fahnestock, Assoc. Editor, *Electronics*. Third Edition, 347 pages, 234 illustrations. $6.00**

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Gives in detail effective, systematic appraisal procedures and techniques to follow in finding the value of industrial, commercial, utility, and natural-resource property. Explains various appraising tools . . . where to get data . . . how to use property and other accounting records . . . how to take inventory . . . how to get and analyze cost data, price, and construction cost. Gives a special view of depreciation as it applies to appraising, and help for appraising limited-life properties. **By Anson Marston, Robley Winfrey, and Jean C. Hempstead, all of Iowa State College. Second Edition, 486 pages, 31 illustrations, 74 tables, $8.00**

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Irrigation Plan . . .

. . . offered by Idaho Power as alternative to USBR proposal expected to have bearing on Hells Canyon dispute

An alternative to the Bureau of Reclamation's plan for irrigation of Idaho's Mountain Home project—one that is expected to play an important role in the Hells Canyon Dam controversy—has been presented to Secretary of Interior McKay.

The plan—drafted by W. Glenn Sloan, co-author of the Pick-Sloan plan for Missouri Valley development—is claimed to do twice the work of the bureau plan at less than half the per acre cost.

It would irrigate 123,000 acres of desert and at the same time drain Boise Valley farm land which is now threatened by a rising water table. Water from Boise and Snake Rivers also would be utilitzed. The cost: $53 million or $430 per acre. Two power plants—one with capacity of 23,000 kw the other 48,000 kw—would provide energy to operate pumps to drain the farm land.

The bureau proposal, which would not tackle the Boise Valley problem, would spend $235 million to irrigate 183,000 acres, or $1,090 per acre. It originally called for use of power revenues from Hells Canyon Dam to help pay costs of the project. The bureau plan proposed importation of Payette River water into Boise Valley, releasing Boise River water for use in Mountain Home area.

Financed by Idaho Power . . . Drafting of the Sloan plan was financed by the Idaho Power Co, which has been concerned with the effect the valley's rising groundwater would have on the future economy of the area as well as with the development of the Mountain Home area.

The Sloan proposal is expected to be important in the Hells Canyon controversy because it rounds out the power company's comprehensive plan for Idaho river development.

Revision of Idaho Power's original five low-head dam proposal, strictly a power development, into a three-dam plan, one with a large storage reservoir, gave the flood control and navigation elements necessary to comprehensive development.

Idaho power proposes low dams at

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DUXSEAL is a nonhardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

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Made of heavy weight hard woven canvas and specially designed, flexible, waterproof leather bottom — long wearing. Bag is rip proof.

No metal parts are used in the manufacture. This feature eliminates the danger of contact with live wires or current carrying equipment.

WRITE FOR BULLETIN A-83

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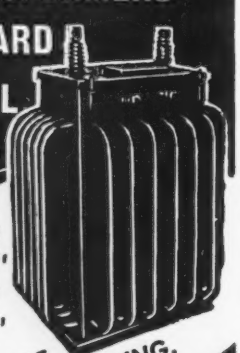

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SEND FOR NEW CATALOG NO. TR-50

CHAS. EISLER
EISLER ENGINEERING CO., Inc.
769 SOUTH 13th ST. NEWARK 3, N. J. U. S. A.

Oxbow and Hells Canyon and a high dam with 1 million acre ft of storage at Brownlee.

The addition of the Mountain Home project provides irrigation features of the development.

It is believed likely that the company will use its alternate plan at the Oxbow hearings to undercut Reclamation Bureau claims that Hells Canyon must be built to supply aid to reclamation. The Sloan Mountain Home project is virtually self-liquidating without Hells Canyon power revenues and with almost no non-reimbursable features. Its proponents claim it would reduce indirect federal subsidies by 80%.

AG&E and Westinghouse Conduct Lightning Tests

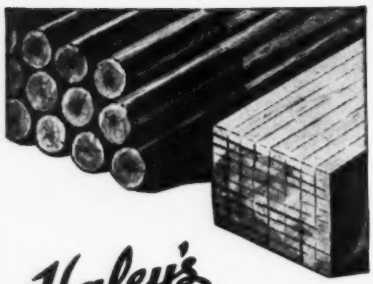
A lightning test program is being undertaken by American Gas & Electric Co and Westinghouse Electric Corp to get first-hand information on the effect of lightning on high voltage transmission lines.

The tests are being conducted at Brilliance, Ohio, where American G&E has two experimental lines which are insulated beyond the level required for the highest transmission voltages considered to date. Westinghouse supplied a 200,000-kv surge generator that has been erected at the open end of the two 1.5 mile lines, farthest from the substation.

The two companies listed the objectives of the tests as determination of: (1) attenuation of surge voltages that travel along the line, (2) slope of travelling wave fronts, (3) voltage coupling factors, (4) influence of line conductor attenuation on selection of substation insulation levels, (5) effect on several lines entering the station on the lightning voltage in the station, (6) most effective location of lightning arresters with respect to remainder of substation equipment.

Of the two three-phase lines being used in the tests, one is strung with 1.65 in. HH copper, and the other with 2-in. expanded ACSR.

Although the major objective is to get extra-high voltage data, the equipment may be used to obtain similar information on lower voltage lines. Accordingly, the test program contemplates the restringing of one phase with at least two different sizes of conductors.



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Pennsylvania W&P Claim Denied by District Court

Pennsylvania Water & Power Co has lost another round in the drawn-out legal battle involving its contracts with Consolidated Gas, Electric Light & Power Co of Baltimore.

Most recent development is a decision by a U. S. District Court which denies Penn Water's claim of $17.7 million against Consolidated for treble damages under the Sherman Anti-Trust Act. The suit charged that the damages were incurred when Consolidated allegedly prohibited Penn Water from building a steam electric generating facility.

The court refused to sustain the Penn Water claims on the ground that the company was equally involved with Consolidated in writing the contract which was the target of the suit.

Duquesne Light Breaks Ground for Substation

Duquesne Light Co broke ground last month for a new substation to serve the heart of Pittsburgh's downtown area. The station will be known as Forbes Substation.

The installation will consist of two 40,000-kva transformers initially. Underground feeder cables will radiate from this location to existing and new transformer vaults supply the downtown underground network system, and in certain instances serving transformer installation located in the larger buildings.

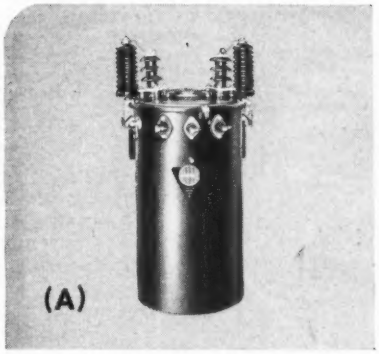
The outdoor equipment which will be located behind the main building will consist of totally enclosed buses and connections controlled by circuit breakers operating on the air-blast principle in contrast to the usual oil circuit breakers. Lower voltage, totally enclosed air-blast circuit breakers, associated buses and feeder equipment will be housed in the three-story building. A battery of large air compressors to supply air for the circuit breaker operation also will be contained in the building.

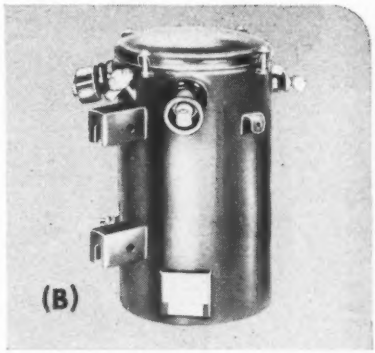
The building will be completely air-conditioned to protect the equipment. The substation will be controlled entirely from Duquesne Light's system operator's office.

Cable will be "high pressure oil-filled pipe-type cable."

(*More News on page* 238)

Transformer Manufacturers **Know** oil oxidation problems...

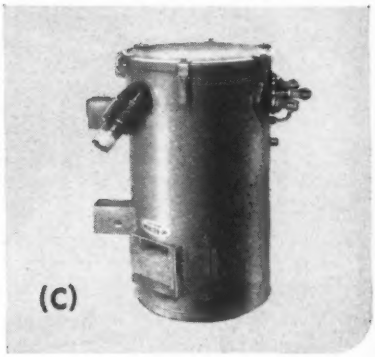




(A) Line Material Co.

(B) RT&E Co.

(C) Allis-Chalmers Manufacturing Co.



and they use DBPC!

• Leading manufacturers have proved by exhaustive tests the need for an inhibitor to protect transformer oil from oxidation and sludge. So they sell their transformers already protected—with DBPC inhibited oil.

DBPC Oxidation Inhibitor is placed in the transformers at the time of manufacture, and its constant use is advised from then on. DBPC keeps peroxide formation within the transformer to a minimum, and retards sludge formation. Because it lengthens the oil life, DBPC reduces oil cost and drastically cuts transformer maintenance costs.

Practically all of the transformer manufacturers in the country have adopted the use of inhibited oil in distribution transformers.

Most major oil suppliers advocate inhibiting, and will supply new inhibited oil upon request. So when you buy transformer oil, or reclaim used oil, insist that it be inhibited with DBPC—for the life of your transformer. If you wish additional information on DBPC, write to:

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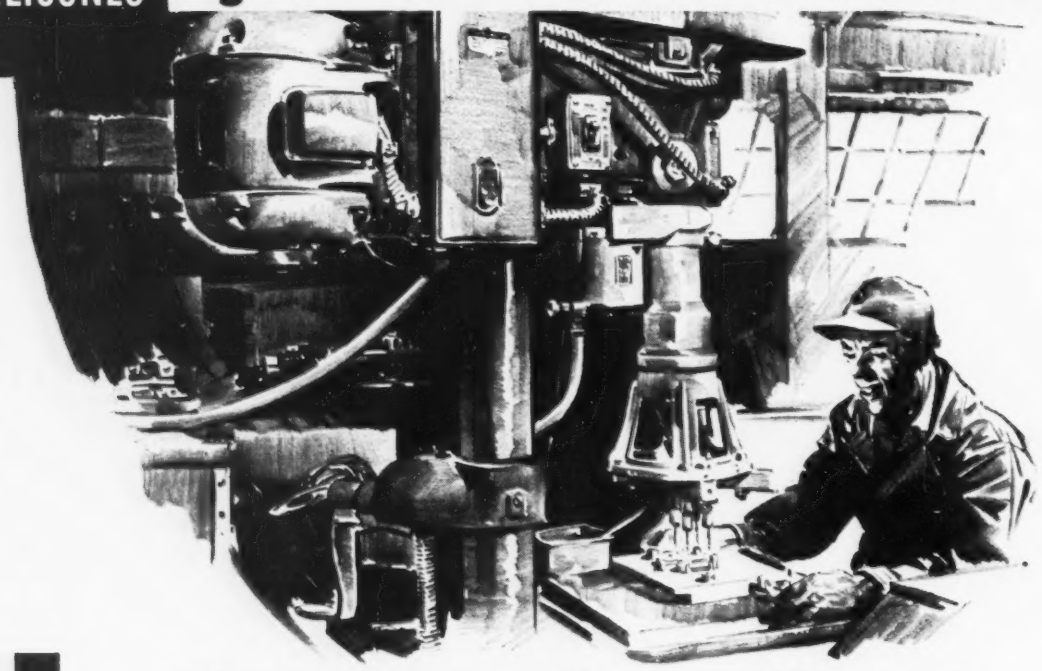

Triple production; cut tool cost over $200 a month

OPTIMUM cutting speed of the 6-32 taps in the 4-spindle drill press operated by the Allen-Stevens Corp., contract die casters of Jamaica, L. I., New York City, is in the range of 1800 rpm. In an automatic feed machine, that spindle speed means about 1450 cycles, or 2900 full reverses per hour.

That many reverses overheated the 1 hp Class A insulated drive motor so badly that it had to be shut down a total of 2 hours out of every 8. To keep the machine operating 8 hours a day, spindle speed had to be reduced to 655 rpm—resulting in tap breakage averaging $10 a day.

Allen-Stevens got themselves out of the dilemma by rewinding the motor with Class H insulation made with Dow Corning silicones. Spindle speed was immediately returned to optimum, and tap breakage stopped. Production has since tripled. Lost time has been eliminated entirely.

That's the kind of performance that has persuaded alert production, maintenance and top management men to specify Silicone (Class H) Insulation for hard working motors. Used to uprate motors by as much as 50%, it gives you more power at no additional expense for fittings, mounts or wiring. Cost is very little more than rewinding with the next best class of insulation.

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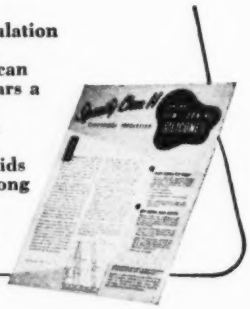

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Advertising In This Issue

Advertising Council Inc. 229
Aerotec Corp., The 178
Allis-Chalmers Mfg. Co. ....2nd Cover
20, 21, 32, 33, 54, 99, 179
Aluminum Co. of America 208, 209
Aluminum Co. of America,
Paint Service Bureau 69
American Blower Corp. 67, 68
American Steel & Wire Div
United States Steel Corp. 30, 31
Anaconda Wire & Cable Co. 165
Anderson Brass Works, Inc. 91

Babcock & Wilcox Co. 26, 27
Bakelite Co. Div. Union Carbide
& Carbon Corp. 9
Baltimore & Ohio Railroad 43
Bartlett Tree Experts, Inc. 219
Bechtel Corp. 97
Bell Telephone Laboratories 96
Benjamin Electric Mfg. Co. 87
Bentley, Harris Mfg. Co. 76
Blackburn Corp., Jasper 58
Blaw-Knox Co. 45
Bodendieck Tool Co. 231
Bowser, Inc. 210
Brown Boveri Corp. 28
Brown Co. 168
Burndy Engineering Co., Inc. 86

C-O-Two Fire Equipment Co. 199
Cable Spinning Equipment Co. 216
Cardox Corp., The 204
Central Transformer Corp. 90
Chance Co., A. B. 194, 195
Chapman Chemical Co. 222
Chase Brass & Copper Co., Inc. 89
Chase-Shawmut Co. 172
Chevrolet Div. of General Motors 66
Chicago Pneumatic Tool Co. ..200, 201
Cole Electric Co. 242
Combustion Engineering-Super-
heater, Inc. 56, 57
Continental-Diamond Fibre Co. 163
Cope, Inc. T. J. 225
Copperweld Steel Co. 34
Cornell-Dubilier Electric Corp. 71
Crescent Tool Co. 46

DeLaval Separator Co. 77
Diamond Power Specialty Corp. 157
Directory of Engineers 238
Dow Chemical Co. 180 190
Dow Corning Corp. 236
Driver-Harris Co. 12
du Pont de Nemours & Co., (Inc.)
Grasselli Chemicals Dept. 205
du Pont de Nemours & Co., (Inc.)
Rubber Chemicals Div. 73

Eastern Specialty Co., ... 224
Ebasco Services, Inc. 60
Eisler Engineering Co., Inc. 234
Electric Service Mfg. Co. 14, 15
Electrical Engineers Equip. Co. 232
Electrical Testing Laboratories,
Inc. 207
Electrical World 52, 53
Electroline Company 5
Engineers, Directory of 238

Federal Electric Products Co.
3rd cover
Fisher-Pierce Co., Inc. The 164
Four Wheel Drive Auto Co. 72

G&W Electric Specialty Co., Inc.
18, 19
General Cable Corp. 184, 185
General Electric Co.
Apparatus Dept. 13, 133, 134
135, 136, 139, 141, 143, 213
Construction Materials Dept. ... 82
Electronics Dept. 59
Lamp Dept. 197
Goodrich Chemical Co., B. F. 196
Gould-National Batteries, Inc. 88
Grinnell Co., Inc. 148
Guth Co., The Edwin F. 186

Haartz-Mason, Inc. 222
Haley & Co., Inc. R. G. 234
Harris Inc., Frederick R. 234
Hazard Insulated Wire Works ..4, 98
Highway Trailer Co. 191
Holan Corp., The J. H. 70
Hotpoint, Inc. 84
Hubbard & Co. 171

Indiana Steel & Wire Co. 218
Industrial Products Co. 234
Ingersoll-Rand 83
I-T-E Circuit Breaker Co. 146, 147
I-T-E Circuit Breaker Co.,
R & I E Equipment Div. 17

Jefferson Electric Co. 174
Jenkins Brothers 224
Johns-Manville 233

Kaiser Aluminum & Chemical
Sales, Inc. 80
Kearney Corp. James R. 230
Kellogg Switchboard & Supply Co. 231
Kerite Co., The 100
Kidde & Co., Inc. Walter 215
Klein & Sons, Mathias 218
Koppers Co., Inc. 192, 235
Kuhlman Electric Co. ..... 4th cover

Lapp Insulator Co., Inc. 10, 11
Line Material Co. 61, 62, 63, 64, 65
Locke Dept., General Electric Co.
24, 25

Magnatran, Inc. 230
Mallory Co., Inc., P. R. 221
McCabe Powers Auto Body Co. ... 183
McGraw-Hill Book Co., Inc. 233
Moloney Electric Co. 150, 151
Monsanto Chemical Co. 47
Mycalex Corp. of America 220

National Electric Coil Co. 159
National Telephone Supply Co. 167
National Vulcanized Fibre Co. 29
Neils Lumber Co., J. 206
Nickel Cadmium Battery Corp. 220
Nordberg Mfg. Co. 217

Ohio Brass Co. 153, 154, 155, 156
Okonite Co., The 4, 98
Orangeburg Mfg. Co., Inc. 55
Overton Co., S. E. 228

Pacific Electric Mfg. Corp. 85
Page Steel & Wire Div. American
Chain & Cable 226
Palnut Co., The 226
Pennsylvania Transformer Co. 173
Philadelphia Gear Works, Inc. 75
Philco Corp., Industrial Div. 203
Porcelain Insulator Corp. 176, 177
Porcelain Products, Inc. 44
Prat-Daniel Corp. 8
Pyle-National Co., The 94

R T & E Co. 182
Radio Corp. of America
Engineering Products Dept. 169
Revere Copper & Brass, Inc. 145
Reynolds Metals Co. 95
Riley Stoker Corp. 22, 23
Roebling's Sons Co., John A. 149
Roller-Smith Corp. 74

S&C Electric Co. 6, 7
Sangamo Electric Co. 175
Searchlight Section 239, 240, 241
Sierra Electronic Corp. 166
Simplex Wire & Cable Co. 161
Smith & Son Inc., Seymour 228
Spang-Chalfant Div. National
Supply Co. 78
Standard Transformer Co. 92, 93
Stone & Webster Engineering
Corp. 189
Subox, Inc. 214

Taylor-Wharton Iron & Steel Co. . 152
Tel-E-Lect Products, Inc. 232
Triangle Conduit & Cable Co. 16
Tulsa Winch Div. Vickers, Inc. 198

Union Carbide & Carbon Corp.,
Bakelite Co. Div. 9
Unistrut Products Co. 193
United States Rubber Co. 211
Uptegraff Mfg. Co., R. E. 79

Victor Insulators, Inc. 187

Wagner Electric Corp. 48, 49
Westinghouse Electric Corp. ...35, 36
37, 38, 39, 40, 41, 42, 50, 51, 81
Westinghouse Electric Corp.
Lamp Dept. 227
Weston Electrical Instrument
Corp. 223

York-Hoover Corp. 181

■

PROFESSIONAL SERVICES 238

■

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 239, 240
Selling Opportunities Offered 240
Selling Opportunities Wanted 240
Employment Services 240
NOTICES
Proposal 240
EQUIPMENT
(Used or Surplus New)
For Sale 240-241
WANTED
Equipment 240

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Bills Strengthen Rights of Indiana Cooperatives

Operating rights of Indiana rural electric cooperatives have been redefined and strengthened by a pair of amendments to the Rural Electrification Membership Corporation Act passed without opposition by the Indiana state legislature.

One calls for a mandatory 90-day negotiation period between power companies and cooperatives when a rural area served by the co-op is overtaken by expanding corporate boundaries of a neighboring town where a private company has franchise rights. If an agreement cannot be reached on recompensing the co-op for its investment, the issue may be taken to a circuit court for adjudication.

Another amendment to the basic law enables cooperatives to serve towns that grow to more than 1,500 population, after the co-op initiates service. Cooperatives were prohibited from doing so prior to new amendment to statute.

Nevada Use of CVP Power Attacked by Legislature

The signing of a contract to deliver Central Valley Project power outside California was attacked in a resolution adopted by both houses of the California legislature.

The resolution stated, "The fulfillment of the purposes for which the Central Valley Project was conceived requires that power generated in connection with the Central Valley Project be utilized first to meet the needs of the people within the state and to accomplish the full utilization of the Central Valley works before any power is made available for use outside of California."

The resolution was aimed at the Bureau of Reclamation-Colorado River Commission of Nevada agreement in which the Nevada agency would receive 35,000 kw of power if the agency could make arrangements for transmitting the energy from the CVP load center at Tracy, Calif.

To do this it would require the use of the facilities of the Pacific Gas & Electric Co and Southern California Edison Co.

In its resolution, the California legislature urged the two power companies not to enter into any wheeling or other agreement which would facilitate the delivery of power developed by the CVP for use outside of California.

The resolution also urges the California Public Utilities Commission to defer approval of any contracts providing wheeling of power developed by CVP facilities until the legislature can consider measures "necessary to protect the public interest in connection with such contracts."

The USBR-Colorado River Commission contract will be void if arrangements cannot be made by June 30 to wheel the power to Nevada.

Oregon OKs Participation in Interstate Power Plans

Oregon legislators have set up machinery for state participation in any move the Pacific Northwest states may initiate in writing a Columbia River basin interstate compact by which the states might acquire existing federal hydroelectric projects and take over the job of development of the basin water resources.

The Oregon legislature last month voted almost unanimously approving a resolution to appropriate $20,000 for Oregon's share in any regional conference with neighboring states of Washington, Idaho, Montana, and Utah. The money will be used by the 15-member state committee on interstate cooperation, an organization which already exists.

Before the states could go ahead with any proposal they may formulate, the compact would require Congressional approval as well as legislation action by the respective states. While the Senate vote was unanimous, State Senator Richard L. Neuberger, Democrat, said he was opposed to such compacts on the ground they were "unworkable." He declared: "We would be opening Pandora's box if we allow the Columbia River to be developed by the states. Every compact in the country has failed."

Co-op Plant Wins Award

Wolverine Electric Cooperative, Big Rapids, Mich., received an award last month for the most efficient operation of a Rural Electrification-financed internal combustion plant. The winning plant, Johnson Plant at Hersey, produced power at 5.96 mills per kwhr. The award, a bronze plaque, is presented annually by "Diesel Progress" magazine on the basis of operating reports.

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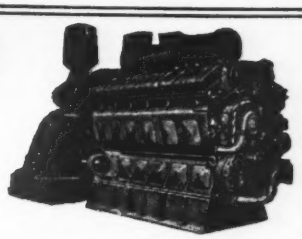

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KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1980	Nordberg	TS-217	2800	225	320	Enterprise	DSG-6	560	450
1500	Fairbanks Morse	33E16	2000	300	300	General Motors	8-268A	450	1200
1136	Fairbanks Morse	38D	1600	720	250	Fairbanks Morse	37-E	375	360
1100	General Motors	16-278A	1600	720	200	General Motors	8-268A	350	900
750	General Motors	12-567	1080	720	150	Worthington	CC-4	225	450
500	Baldwin	VO-8	750	514	150	Buckeye	80	240	600
500	General Motors	8-278A	750	720	100	Worthington	BB-5	150	600
500	General Motors	8-567	720	720	100	General Motors	3-268A	150	1200
400	Ingersoll-Rand	S-8	600	720	60	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	30	Internat'l Harvester	UD-14	45	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

FROM AVAILABLE STOCK

TURBO GENERATORS IN STOCK

Q.	KW	Make	Resc.
1—	1000	G.E.	Non-Cond—190 lbs-2400-3-60
1—	1000	Moore	Condensing—Extraction—190 lbs., 2400-3-60—SurfaceCond.
1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter
1—	400	Westgh.	Non-Cond—125/150 lbs., 5/10 lbs. B.P., 240/480-3-60
1—	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B.P., 480-3-60

FREQUENCY CHANGERS

KVA	Make	RPM	Voltages	Frequency
1—3750	G.E.	300	2400/4150—2400/4150	25/60/25
1—3125	G.E.	300	2400/4150—2400/4150	25/60/25
2—2500	G.E.	750	2400/4150—2400/4150	25/62½/60/24

MOTOR GENERATOR SETS

3 ph, 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6600/13200
2—	2000	G.E.	500	666 25 cy.	11000
1—	1500	C.W.	514	115	4000/13800
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
3—	1500	G.E.	514	250	6600/13200
1—	1500	G.E.	600	600	2300/4150
1—	1000	G.E.	900	260	4100/6900
2—	1000	Whse.	900	600	2300/4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	900	250	6609/13200
1—	500	Whse.	1200	125/250	2330
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	150	G.E.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—2500	Whse.	OISC	3	26400/13200 x 480
3—1250	G.E.	HVDDJ		6600x550
1—1150	A.C.	OISC		13200x480/2400
3—1000	G.E.	HVDDJ	1	2200/480

BELYEA COMPANY, INC.

OFFICE & SHOP
51 Howell St. Jersey City 6, N. J.

TRANSFORMERS

FOR SALE

6—1000 KVA Mol. 11500—2400/4160Y
3— 500 KVA Pitts 22000—2300/4000Y
3— 500 KVA G-E 22000—2300/4000Y
3— 333 KVA W-H 6600—2300
3— 200 KVA G-E 22000—2300
3— 200 KVA Mol 3450—2300
3— 150 KVA G-E 44000—600/2400
3— 150 KVA G-E 19050/33000Y—2540/4000Y
3— 150 KVA A-Ch. 13800—2400/4160Y
2— 150 KVA G-E 6900—230/460
3— 100 KVA G-E 33000—6900/11950Y
3— 100 KVA G-E 13200—2300
3— 50 KVA A-Ch 33000—6900/11950Y
3— 50 KVA A-Ch 33000—2400/4160Y
3— 50 KVA A-Ch 13200—2300/4600

Many other items in stock.

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Reliable rewind and repair service on all makes of transformers

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40 Years Dependable Service

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180 P.S.I.—525°F Total Temp.
3 phase 60 cycle 2300 volt
With Surface Condenser
GOOD CONDITION

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POWER PLANT COMPLETE

539 kw 220 V., 3 phase, 60 cycle. With cooling system, auxiliaries, voltage regulation, and test equipment. Consisting of 4 Fairbanks-Morse & Co. 32E14 diesel engines with matched generators. Can be seen in operation. Write for complete information.

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TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V. 2300V. Pyranol
2— 750 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/480V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V. sec.
2— 200 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
1— 200 KVA G.E., 3 Ph., 2400-220 sec.
3— 200 KVA Mol., 1 Ph., 2300 V. 220/440.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM. 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60
2— 150 H.P., Al. Chal. 360 RPM, 440V. 3/60

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V. 720 RPM, 4000 Syn.
1—1000 KW G.E., 600 V. 514 RPM. 4000V Syn.
1—1000 KW Whse., 275 V. 720 RPM. 4000 Syn.
1— 176 KVA West., 1Ph., 220V. Motor 3Ph., 440V.
1— 150 KW G.E., 126/250V. 1200 RPM. 2300 Syn.
1— 100 KW G.E., 230V. 900 RPM. 2300V. Syn.

SLIP RING MOTORS

1— 400 H.P., West. CW, 450 RPM 550V.
1— 250 H.P., West., CW, 600 RPM, 440V.
1— 200 H.P., West., CW, 600 RPM, 440V.
3— 150 H.P., Al. Ch. 1800 RPM. 2300V., 3PH, 60 Cy.
1— 100 H.P., G.E., MT 600 RPM, 440V.

Large Stock of A.C. and D.C. Equipment

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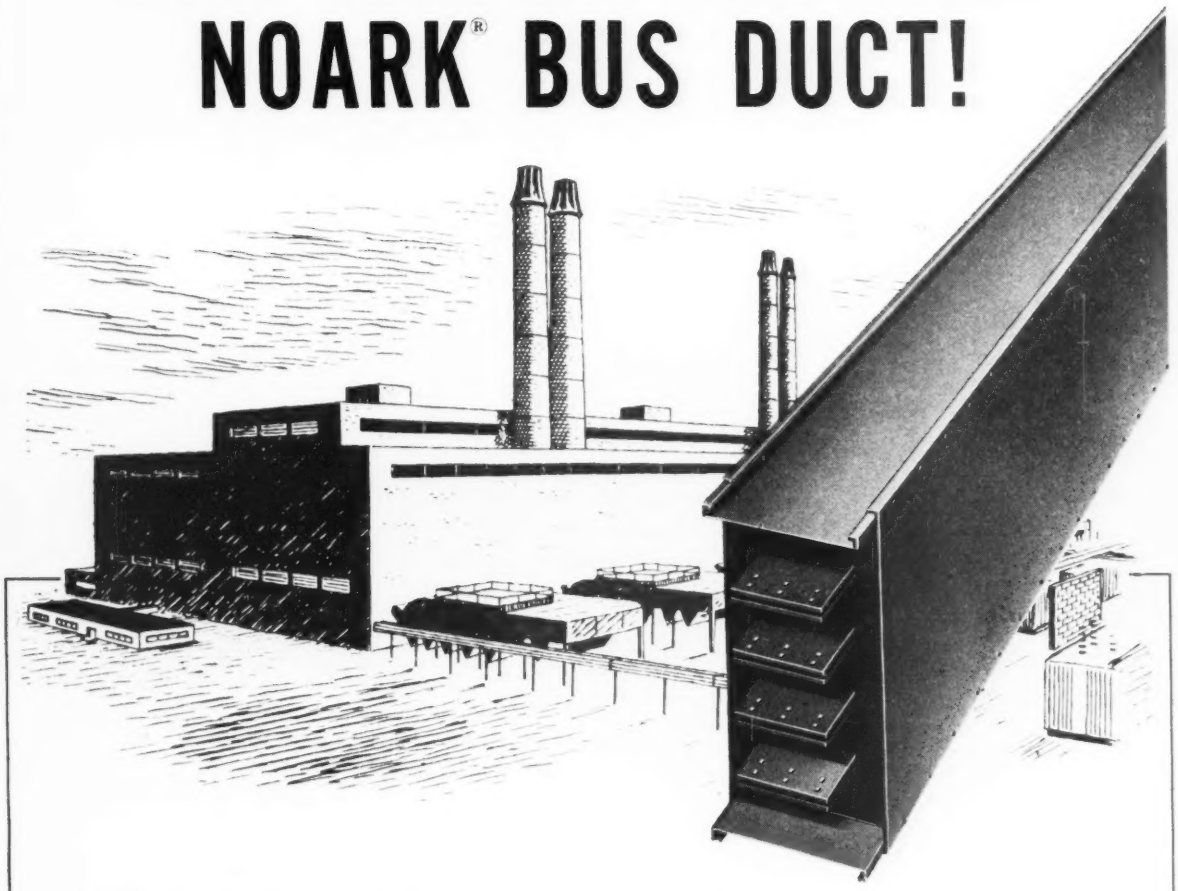
34,500 volts—600 amperes—Type O-2
Vertical break. Three pole. Single throw. Group operated.
One pole shown.
SILVER TO SILVER CONTACTS

CON EDISON CHOOSES NOARK® BUS DUCT!



CONSOLIDATED EDISON'S new Astoria electric generating plant, across the East River from Manhattan, is nearing completion. Furnished throughout with the most modern and efficient equipment, Federal Noark feeder type Bus Duct of 2000 and 3000 amp. capacity has been installed to carry power to the motors driving the forced draft fans and boiler feed pumps. Designed to meet Consolidated Edison's low temperature specifications, the bus bars are specially wrapped and the bus duct housings are of aluminum. Installation was made by Lord Electric Company, Inc., New York City.

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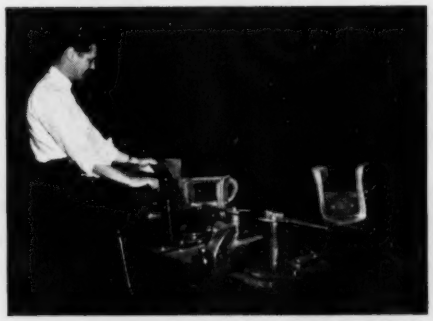
HOW KUHLMAN BENT IRON CORES ARE MADE

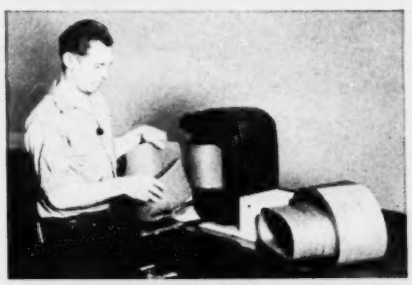
By way of celebrating a 20th anniversary, this brief picture-story shows the present-day manufacture of the now famous Kuhlman Bent Iron Core. The patent on this efficient core, (no. 1,933,140) was granted in 1933—yet so advanced was its design that today its essential characteristics remain the same and have influenced the design of many makes of transformer cores.

First, the laminations are cut to size and stacked. The operator clamps the stacks onto a hydraulic folding machine which bends them over a form into a U-shape. Before removing the pressure, the operator applies a clamp to the laminations to hold them in place.

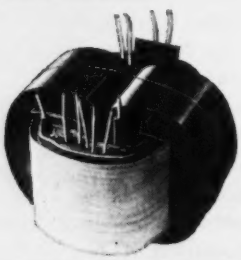


Another operator completes the bending by overlapping each alternate lamination. Levers on each side of the vise hold down each lamination as it is folded into place. The inner laminations have been cut shorter so that the outer ones will overlap.

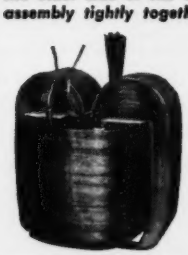
After the cores have been bent they are bound with wire and annealed to relieve the stresses caused by bending. Here are two annealed Bent Iron Cores next to the coil to which they will be assembled.



The assembler has disassembled a core and is now filling the coil lamination by lamination. The laminations retain their shape because they have been annealed. As soon as he has assembled a core to the other side of the coil, he will bind the whole assembly tightly together.



Here is a completed Bent Iron Core and coil assembly. The four air gaps of the old butt type core have been reduced to two, and the magnetic flux will always flow parallel to the grain of steel, never crossing it.



This is a recent variation of the Bent Iron Core, known as the BIE. Notice that the laps are at the top rather than at the sides. This allows for the manufacture of Bent Iron Core transformers of higher KVA rating without increasing the overall size of the transformer.

Kuhlman **ELECTRIC COMPANY, BAY CITY, MICHIGAN**
CRYSTAL SPRINGS, MISSISSIPPI

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,*
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